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Green Chemistry in the Arab Region

Promoting Sustainability and Chemistry

IUPAC, COCI, and the Chemical Industry

The Impact of International Exchange

From the Editor

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This is one of those years for IUPAC. As we start a new biennium, major changes are apparent, including the many new faces we must welcome to our numerous committees. With these changes come an influx of energy and new ideas, which when brewed with the current expertise will pave the way forward for IUPAC and its committees. (Is that not a perfect example of what "chemistry" is all about? Mixing this and that, to make something better. ☺)

Seriously, the working year started with no delay. Already a small group from the Committee on Chemistry in Industry (COCI) met in early February to review and establish future strategies for the committee. David Evans, a newcomer to IUPAC who comes straight from the industrial world and displays the dynamism of a pop singer, now heads this group. See page 4, "The Times They Are A-Changing" and COCI Will Need to SIng Some New Songs, by D. Evans.

I was fortunate to be able to participate in that meeting with a mixed group of newcomers, including the chairman and Colin Humphris from CEFIC (the European Chemical Chemistry Council), but also experienced members such as Mark Cesa (secretary and now vice chairman COCI), Nelson Wright (retiring chairman), and Jonas Unger. Evans lost no time setting the stage and told the five of us that the doorway to the meeting room was a magical arch that made us all equal to contribute to the brainstorming sessions on the agenda. I have to admit that my experience with IUPAC did prepare me to contribute somehow, but I was not really prepared for the pace, openness, structure, and output-orientation of the meeting. These guys are something else, I thought. I cannot wait to work more with them, and I think you should too! They are the "Applied" in IUPAC. As Evans simply puts it, "COCI's job is to ensure that the interests, viewpoints, and concerns of the chemical industry and its employees are represented and understood within IUPAC and vice versa."

So if you think that there are gaps between the "pure" and the "applied" aspects of what IUPAC does, you should know that these guys are bridge builders. Your contributions to their endeavor could be as simple as letting them know where you stand and seeing if together you can make a bridge. (I shall stop now or I might just write a song for COCI's new repertoire!)

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Cover: "Chemistry in the Arab Region," by Francesco Tundo—see feature p. 8. For more about the artist see <www.iupac.org/images/tundo>.

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Secretary General's Column

Advancing the Business of IUPAC

by David StC. Black

Since the General Assembly in Ottawa last August, I have had some time to think about the specific role of the secretary general in the affairs of IUPAC. In this respect, I have received continuing help and advice from the retiring secretary general, Ted Becker. So, at the outset of this column, I should like to express not only my appreciation of the unstinting work Ted has done for IUPAC over the last eight years in particular, but also to emphasize what an enormous influence he has had on the "modernization" of IUPAC business. All of us involved in IUPAC owe Ted a huge debt of gratitude.

It is always interesting to read the Statutes and Bylaws of an organization like IUPAC, but they are more illuminating in terms of what is left unsaid, but hinted at, rather than the printed bare bones. Flesh is always more interesting than bones, but the former definitely needs the latter! So the Statutes indicate that "the secretary general shall carry out the business of the Union as specified by the Council, by the Bureau, by the Executive Committee, or by the president, and be responsible for keeping its records and for the administration of the Secretariat." It is also clear that the Statutes and Bylaws look out of date, but that is always the case in a vibrant and living organization. The key is to use and interpret them seriously, but with the emphasis on the spirit of the law rather than the letter.

From its inception in 1919, IUPAC has changed greatly, as has the whole discipline of chemistry, so it is very important to deal with change in an effective way. The greatest rate of change seems to have occurred in the years since the Secretariat moved from Oxford to North Carolina. One of the most important changes happened recently with the introduction of the project system. During the next few years, it will be a priority to utilize this system in a routine manner to ensure the best outcomes for IUPAC in particular and for international chemistry in general.

One of the strengths of the project system is that grants are accessible to all, not only those on IUPAC committees. Consequently the Divisions can encourage promising projects through the targeting of experts from any part of the chemical world. The scope of projects is ever widening, taking into account emerging areas of chemistry, while continuing to deal with the rigorous issues of nomenclature, terminology, standardization of data and procedures and so on. The *IUPAC Handbook* lists guidelines and the review procedure, as well as all current projects, and this makes interesting reading as a potential source of ideas for new projects.

The Divisions are actively involved in the sponsorship of major IUPAC conference series, and these present a wonderful opportunity to develop new projects for the benefit of chemistry. These conferences provide an easy way to get a wide range of ideas in quite a short period, and I think the registrants would welcome an opportunity to discuss possible important projects, and to think a little about what IUPAC can do. I recall a session at the Warsaw Organic Synthesis conference (ICOS-13) in 2000, when there was a very well-attended and lively discussion about the abbreviation of protecting groups, in relation to an IUPAC project. Conferences are all about stimulus and communication, so why not use them to stimulate new projects?

I mentioned the role of conferences in communication, and communication is a crucial issue for IUPAC. There are already many chemists involved in IUPAC activities of one sort or another (the *Handbook* lists about 1800) and we are encouraging others to become involved. Therefore, a strong and clear communication network is essential. The establishment of the Union Advisory Committee should at least provide better linkage with the National Adhering Organizations and provide reliable feedback on specific questions. Communication to the widest possible reaches of the chemical community also needs to be improved, and the profile of IUPAC needs to be raised.

Conferences are all about stimulus and communication, so why not use them to stimulate new projects?

There is a widespread, and not completely unfair, view that IUPAC is just about boring things like

The 2003–2004 *IUPAC Handbook* is being finalized and should be available in March 2004; its entire contents is also online at <www.iupac.org>

nomenclature and data standardization, with the occasional naming of the odd new element thrown in. Again there is widespread acceptance that these projects are all very important and need to be done, and done very thoroughly and professionally. However, the impact of these activities on the development of chemistry is not a stimulating one, being reactive rather than pro-active. The conferences deal with the stimulus of new chemistry, but IUPAC can be more pro-active in encouraging and highlighting new and emerging developments, as I have already mentioned. *Pure and Applied Chemistry* offers another excellent way to promote the frontiers of our subject, and its impact factor is rising steadily.

If the profile of IUPAC in the wider chemical community is rather low, it is virtually invisible to the general public. Chemistry, of all subjects, should be one of the easiest to relate to the general public, because it affects every aspect of our lives. Yet, as we all know, this is a tremendously difficult issue to get across, as it involves the education of people who have developed different attitudes, which are extremely resistant to challenge and change. This is a worldwide problem, and therefore is totally appropriate for IUPAC to tackle. In recent years, this challenge has been taken up by the Committee on Chemistry Education, as well as through projects on the public awareness and understanding of chemistry, and chemical contributions to humanity. These issues are strongly linked to the chemical industry and its cornucopia of wonderful achievements and products, many unfortunately not understood as being chemical. We must communicate the outcomes of such projects to the general public in the most effective way possible. By doing so, IUPAC will become a stronger force in the global promotion of chemical enthusiasm, communication, collaboration, and innovation.

Finally, I commence my term with much to learn. I am mindful that the Secretary General is a servant of IUPAC. Therefore, I welcome any advice, suggestions, or ideas that might be forthcoming. Although most official communications are normally sent through the Secretariat, I shall be happy to hear directly from anyone at any time.

David StC. Black <d.black@unsw.edu.au> became IUPAC secretary general on 1 January 2004. He has been involved in IUPAC since 1994 as a committee member of the Division of Organic and Biomolecular Chemistry, and served as Division vice president during 2002–2003.

Short Bio on David StC. Black

David StC. Black, born in Wollongong, earned his bachelor's and master's degrees at the University of Sydney. He was awarded an Overseas Scholarship by the Royal Commission for the Exhibition of 1851, and earned his doctorate at Cambridge. He completed his postdoctoral research at Columbia University, and then began work at Monash University. After nearly 20 years at Monash, he was appointed to the chair of Organic Chemistry at University of New South Wales (UNSW) in 1983.

His research, described in almost 250 publications, has led to the synthesis of new types of organic molecules and the discovery of new synthetic methodologies, particularly in heterocyclic chemistry. He has also co-written a monograph (with J. M. Swan) entitled "Organometallics in Organic Synthesis." His current interest centers on new aspects of indole chemistry.

Prof. Black has engaged in many overseas opportunities. He spent periods of study leave at the ETH Zürich (1968–69), Würzburg University (1974 as an Alexander von Humboldt Fellow), and Cambridge University (1980). He has also held visiting professorships at the Science University of Tokyo (1988), the University of Auckland (1992), Güttingen University (1994), Innsbruck University (1999), and Kobe Pharmaceutical University (2000). He has given numerous invited lectures at international conferences and major universities.

Since 1993, he has been the leader of the Joint Selection Team for Australian Development Scholarships for Indonesian postgraduate students. At UNSW he was head of the School of Chemistry from 1987–1990, and acting dean of the Faculty of Science from January to July 1987. He was appointed associate dean (Research) for the Faculty of Science and Technology in 2000, and reappointed to that position in the Faculty of Science in July 2001.

Black's honors include the Rennie Medal (1970), H. G. Smith Medal (1993), and the A. J. Birch Medal (2003) of the Royal Australian Chemical Institute (RACI). In 1990, he was both the Liversidge Lecturer of the Royal Society of New South Wales and the Royal Society of Chemistry Lecturer. He was president of RACI in 1998, and served as chair of the Australian National Committee for Chemistry from 1999–2003.

IUPAC, COCI, and the Chemical Industry

"The Times They Are A-Changing" and COCI Will Need to Sing Some New Songs

by David A. Evans

What on earth is COCI (pronounced coh-see rather than coh-key) and what's it got to do with IUPAC? And haven't we got enough meaningless acronyms already?

Fair questions and I hope that I can shed some light in this article. COCI stands for the Committee on Chemistry and Industry. Its mission is to ensure that the interests, viewpoints and concerns of the chemical industry and its employees are represented and understood within IUPAC and vice versa, and to promote a dialogue with the other divisions and committees. As such, COCI is one of three operational standing committees of IUPAC, the others being CCE (Committee on Chemistry Education) and CHEMRAWN (CHEMical Research Applied to World Needs)—and that's enough acronyms for now!

IUPAC and the Chemical Industry

From my experience, most of my colleagues in the chemical industry will heap fulsome praise upon IUPAC for its excellent conferences and they will wax lyrically about the truly international "touch and feel" of these meetings. Unprompted, they will congratulate IUPAC for its remarkable success—so rare in this world—in achieving global standards in data and processes, and they might refer to nomenclature and physical constants as prime examples. But for many, the praise stops dead in its tracks at this point. On a positive note, there is little actual criticism (although "boring" crops up from time to time), but in its place we get the dead hand of apathy. The reason: these colleagues say that there is little else of gripping relevance to the day-to-day lives of pressurized practitioners in the industry. However, aside from conference attendance, there tends to be precious little contact with, or knowledge of, IUPAC activities in the laboratories of our companies.

These scientists often say that the last thing they need is something else to read, so it appears that the customary method of knowledge transfer is not going to be effective in spreading our message. The days of altruistic sponsorship by chemical companies of the activities of learned societies such as IUPAC, by releasing scientists and resources, are now fading memories. Times have certainly changed.

Whereas the foregoing is based upon personal observations, I believe that it is representative. This is evidenced in recent years by the very significant drop in the number of industrial partners who enlist with IUPAC as Company Associates.

So what can be done?

Explaining the Benefits

One of the prime objectives of COCI is to engage many more chemical companies in IUPAC affairs. To be successful we clearly need to provide tangible benefits that are met with enthusiasm from industry colleagues. In COCI, we recognize that presently we fall short of this goal, in spite of some sparkling successes. We also understand that we must provide benefits that meet the demands of our industry partners rather than foist an inwardly focussed program of work, onto an uninvolved and unsuspecting customer base. The COCI franchise carries the powerful IUPAC brand, but to be effective, it must accurately reflect the needs of its industrial constituency.

. . . aside from conference attendance, there tends to be precious little contact with, or knowledge of, IUPAC activities in the laboratories of our companies.

COCI and the National Adhering Organizations (NAO's)

One commonplace statement from colleagues in several countries is that their local NAO "Chemical Society" already supplies an excellent service to companies via the activities of its industrial division or group, thus marginalizing the role of IUPAC and COCI. This has been evident to me in both my home country of the United Kingdom and my last adoptive workplace in Switzerland, where the perception is that almost all the benefits of IUPAC can be gained in a locally customized manner from membership in the NAO. Whereas this view may at first appear to be well grounded, further analysis reveals a different picture.

The COCI perspective is definitively global, and supported by the international make-up of the committee and its Company Associates. One of its objec-

tives is simply stated as "sharing best global practice." This is seen by some as a rather feeble catchall, but here I beg to differ. The DIDAC educational program provides a further example. The role of IUPAC in promoting standardization internationally is also of critical importance in this context. In this way, we have the elements of a supportive contract between mature and developing chemical economies.

In conclusion, I believe it is now imperative for COCI to enumerate, explain, and augment its unique benefits in terms of added value to its global constituents. This is a primary objective for the 2004 COCI program.

Times of Change

We live in a time of unprecedented change, as profound as it is exciting. But along with the manifest benefits of successful research and product development come organized opposition and adversarial threats. In many countries and regions, the chemical industry has lost the confidence of the public, who are fed a diet that is rich in misinformation, but thin on the description of benefits. No wonder that the public appreciation of our achievements is low. Again, COCI has a key role to play here in changing our image by developing compelling communication strategies to explain benefits.

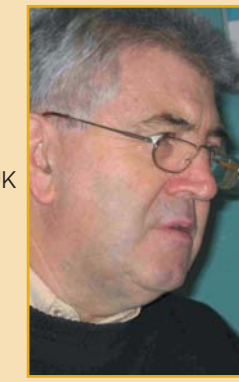
With regard to promoting success in bringing about change, I am very fond of the "change equation" popularized by Richard Beckhard that states that successful change is a function of three essential components:

Change = fn . [Dissatisfaction with the *status quo*] . [vision of the future] . [first practical steps]

Well, is COCI dissatisfied with the *status quo* in the industrial world in which it operates? You bet we are! Many countries in the developed world also are becoming increasingly chemophobic, leading to preposterous regulations and broad-scale wastage of money and effort. It is imperative that we bring an evidence-based straight edge to the popular debate on science.

Do we have a positive view of the future? Yes! We know from past experience the benefits that advances in chemistry can deliver to the world. One only needs to think of the potential future contributions of chemistry to better healthcare, energy, and water to realize this.

About the COCI Officers



David Evans, COCI Chairman

Bio-organic Chemist
B.Sc. Manchester Univ., UK
M.Sc., Ph.D., Manchester Univ., UK
Research Associate MIT, USA
Research Fellow, Cambridge Univ., UK
Previous Job: Head of Research & Technology, Syngenta, AG., Basel, Switzerland
Hobbies: rugby, travel, gardening, public appreciation of science

Mark Cesa, COCI Secretary and Vice Chairman

Organic/Organometallic Chemist
A.B. Princeton University, USA
M.S., Ph. D., University of Wisconsin-Madison, USA
Current Job: Senior Research Associate, BP Amoco Chemicals Inc., Naperville, Illinois, USA
Hobbies: bicycling, baseball, computing

Nelson Wright, Past Chairman

Physical Chemist
B.Sc., Ph.D. McGil Univ., Montreal, Canada
Postdoc Leeds Univ., UK
Research Associate, Chem Dept, McGill Univ.
G.E. Corporate R&D Center, Schenectady, NY
Previous Job: Director, Senior VP Environment & Technology, Synergistics Industries Ltd., Canada
Hobbies: skiing, windsurfing, camping, gardening, new (young) family

To review the entire committee membership, connnect to <www.iupac.org/standing/coci.html>.

Are we clear about the first practical steps? Well, only maybe, because in spite of sparkling progress we have failed in the past to deliver our message to the public, to governments, and to the media in many parts of the world. Thus, we need to revolutionize our approach and we must put new ideas into practice.

. . . we need to revolutionize our approach and we must put new ideas into practice.

The Future for COCI

The year 2004 will see a huge amount of change for COCI and will bring formidable challenges. Nelson Wright, long-standing chairman of COCI, is stepping down from the post and will be sadly missed as an enthusiast and a committed team player. It falls to me to step into Nelson's well-polished shoes—and I recognize that I've got a tough act to follow. It is pleasing to report that Mark Cesa will continue both as secretary and in his crucial role as leader of the Safety Training program.

Some of our work has reached the stage where it may be more appropriately pursued elsewhere in IUPAC (for example COCI's interests in the DIDAC educational program will sensibly transfer to CCE). Thus, the challenge in 2004 for COCI is to develop new programs. A number of areas scream out for attention, such as the Company Associates area—others are to be developed with our customer base. In order to focus upon the achievement of outputs, we are adopting the project-based structure for COCI. The criteria for a project are as follows:

- demand-led; customer represented on project team
- clear objectives
- single project leader; usually a titular member of COCI or equivalent
- overt measures of achievement
- report at every COCI meeting; articles submitted to *Chemistry International*

COCI Project Structure

At the COCI meeting in Ottawa in August 2003, the following project-related ideas were introduced:

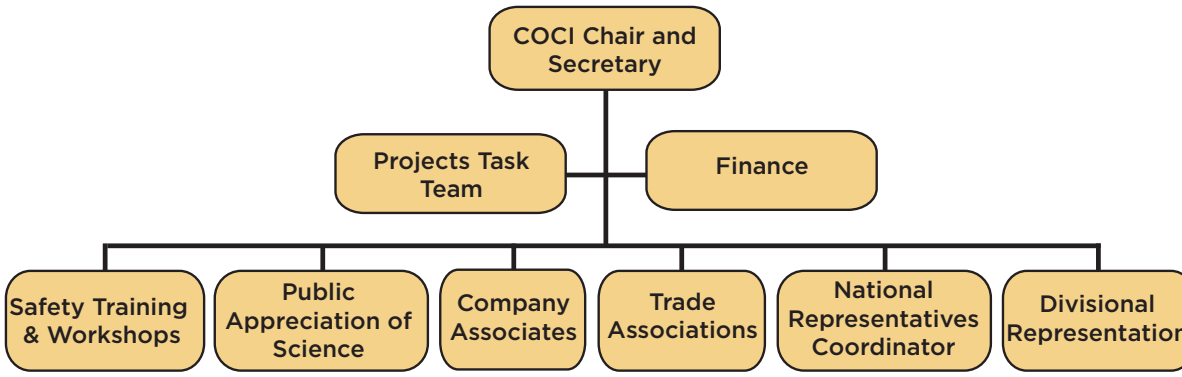
- Projects Task Team—set up a task team to collect ideas for new projects, establish projects, identify leaders, provide general support such as listing sources of project funding, (add) and contribute to the evaluation of project proposals emanating through other IUPAC Committees.
- Safety Training and Workshops Project—continue and expand COCI's current successful approach.
- Public Appreciation of Science Project—support the overarching CCE/IUPAC initiatives in this area with focus on representing industry viewpoints, particularly in the areas of government, regulation, and attendant media issues.
- Company Associates Project—provide a method for improving both the benefits to companies from IUPAC/COCI membership and their understanding of these benefits.
- Trade Associations Project—provide a forum for dialogue with trade associations and introduce their viewpoints, concerns, and influence into IUPAC.
- National Representatives Coordinator—ensure cross contact between national bodies and assist with identification and introduction of national representatives to COCI.
- Divisional Representation—establish liaisons with appropriate IUPAC divisions to facilitate joint interests and minimize duplication.

I can report that the following members of COCI will act as project leaders:

- Projects Task Team, A. Alles (Uruguay)
- Safety Training and Workshops Project, M. Cesa (USA)
- Public Appreciation of Science Project, D. Evans (UK)
- Company Associates Project, A. Ishitani (Japan)
- Trade Associations Project, C. Humphris (Belgium)
- National Representatives Coordinator, J. Unger (Sweden)
- Divisional Representation, A. Smith (UK)

It is pleasing to note the international flavor of this group. Furthermore, there are to date 10 additional members of COCI, who are either National Representatives or Associate Members. COCI also has a formal liaison with the CCE, by having Chairman Peter Atkins as an ex officio on COCI.

Proposed COCI Organization 2004



It is my belief that an organization should reflect the required outputs and support the pattern of work. The proposed organizational diagram for COCI 2004 attempts to achieve this (see above).

Conclusion

There are very significant challenges for COCI in 2004. In addition to the changes already mentioned, it should be noted that a number of stalwarts have either retired or come to the end of their terms. We thank these excellent colleagues for their service, which is all the more appreciated because COCI is a volunteer organization to which they have given up their personal time so generously. This means that COCI faces its challenges with a very new team. We are always open to offers of help. We are very keen to recruit members who are active in industry and we can promise an enthusiastic welcome and the satisfaction of helping us promote the principles of scientific method, so keenly demonstrated and exemplified by the activities of IUPAC.

David A. Evans <dae.jeevans@btopenworld.com> has been chairman of COCI since January 2004.

www.iupac.org/standing/coci.html

Errata

In the Jan/Feb 2004 issue of this magazine, the following errors occurred:

- On page 4, the Manchester Literacy and Philosophical Society should be the Manchester Literary and Philosophical Society
- On page 8, the Nomenclature of Inorganic Chemistry was said to have been published in 1985, but actually it was 1990.

Green Chemistry in the Arab Region

One Step Further in IUPAC's Campaign to Promote Sustainability and Chemistry

by Pietro Tundo and Mohamed Tawfic Ahmed

Green chemistry is an emerging field concerned with the safe practice of chemistry—a goal that people all over the world are interested in attaining. Green chemistry addresses some of our most precious values: human well-being, environmental sustainability, integrity, and safety, and the worldwide need for green chemistry practices should allow human development and prosperity, along with environmental ethics.

The IUPAC Working Party on Synthetic Pathways and Processes in Green Chemistry defined Green Chemistry (2000) as "*The invention, design, and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances.*"

More recently, the European Union's COST Action D29 on Sustainable/Green Chemistry and Chemical Technology (2003) gave a more comprehensive definition: "*Design of products for sustainable applications, and their production by molecular transformations that are energy efficient, minimise or preferably eliminate the formation of waste and the use of toxic and/or hazardous solvents and reagents and utilize renewable raw materials where possible.*"

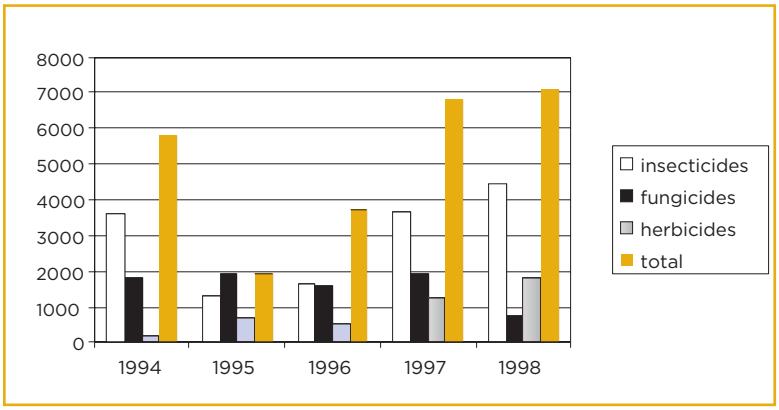
The Arab region, which stretches from the Atlantic Ocean to the Persian Gulf, embraces a population of nearly 250 million spread over about 26 different nations. In most of these countries, the demand for green chemistry emerged after almost half a century of "chemical mania." However, poor chemical practices during this period resulted in harsh experiences and bitter loss. Following are just a few examples:

- The massive poisoning in Morocco in 1959 that resulted from the contamination of edible oil with tri-*ortho*-cresyl phosphate (TOCP) caused the severe illness or death of about 10 000 people
- In Egypt, the irrational use of pesticides triggered a number of environmental and health problems that most Egyptians still sombrely remember. Probably the most dramatic incidents occurred in 1971, 1973 and again in 1976 when neurotoxic organophosphates caused the widespread poisoning and death of about 35 pesticide operators and hundreds of farm animals. Similar incidences of pesticides-caused poisonings were reported in Saudi Arabia (1975), United Arab Emirates (1982), Yemin (1982), and Abdelhamid and Abdelmagead (1996). (Chart below illustrates importation of pesticides in Egypt.)
- Large-scale use of organochlorine insecticides has also inflicted great harm on Egypt's environment, causing significant loss of biodiversity. Similarly, the extensive use of pesticides in Gulf states has caused some serious damage to wildlife and ecosystems.
- In 1972 in Iraq, more than 6000 people were poisoned or killed after consuming imported mercury-treated wheat. Similar instances of pesticide poisoning, although probably on smaller scales, were reported in Saudi Arabia, Sudan, Jordan, and Syria during the 1970s and 1980s.

In other parts of the Arab world, where oil is the major source of revenue, another form of "chemical mania" resulted in a different set of problems. The massive volumes of waste generated from the oil industry and oil shipping have fouled the environment and affected people and wildlife.

It has become clear that levels of toxicants, especially those suspected of being carcinogenic, are much higher in the marine ecosystem of the Gulf countries than in international waters. Similarly, in these countries the residues of noxious gases such as

Annual Importation of Pesticides in Egypt (in tons)



ozone, sulphur dioxide, carbon monoxide, and many others exceed international permissible levels.

With the prevailing trend of industrialization and urbanization in almost all Arab countries, some other environmental and health problem have started to unfold. A recent World Bank report (No 25175- EGT) estimated that the cost of environmental degradation in Egypt in 1999 was 10-19 billion Egyptian pounds, or 3.2% to 6.4% of the country's gross domestic product (GDP), with a mean estimate of 14.5 billion Egyptian pounds (LE) or 4.8% of GDP. (See table for more details.)

Annual Cost (in millions of Egyptian pounds) of Environmental Degradation (mean estimate)

	Million LE per year	Percent of GDP
Air	6 400	21%
Soil	3 600	12%
Water	2 900	10%
Coastal zones and cultural heritage	1 000	3%
Waste	600	2%
Sub-Total	14 500	4.8%
Global environment	1 900	6%
Total	16 400	5.4%

Lead levels in Cairo are among the highest in the world, and are estimated to cause between 15 000 and 20 000 deaths a year, according to a 1996 report by the Egyptian Environmental Affairs Agency.

Other reports (Bashy, 1987) have shown that in Egypt and Saudi Arabia, pollution from the cement industry is causing widespread health problems, including serious pulmonary disease, in people who live nearby. Meanwhile, the health impacts of phosphate mining and processing in Morocco are a major concern.

The need for green chemistry in the Arab world is great and the role it can play is significant. We propose to produce a book on green chemistry in the Arab world that could provide a much-needed, critical examination of how chemical practices need to change so that industry and agricultural can be sustainable and people and the environment can be healthier. Such a book would help educate decision makers in Arab countries about the validity of green chemistry. As we envision it, the book would show how green chemistry techniques can reduce risks, increase profits, and maintain environmental integrity and sustainability.

The book would capitalize on the experiences of a number of chemists from different Arab countries.

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The book would also draw from the experience of the Italian Interuniversity Consortium for Chemistry for Environment, which has endeavored to establish a foundation for green chemistry in some Arab countries south of the Mediterranean through a number of workshops, seminars, and joint activities.

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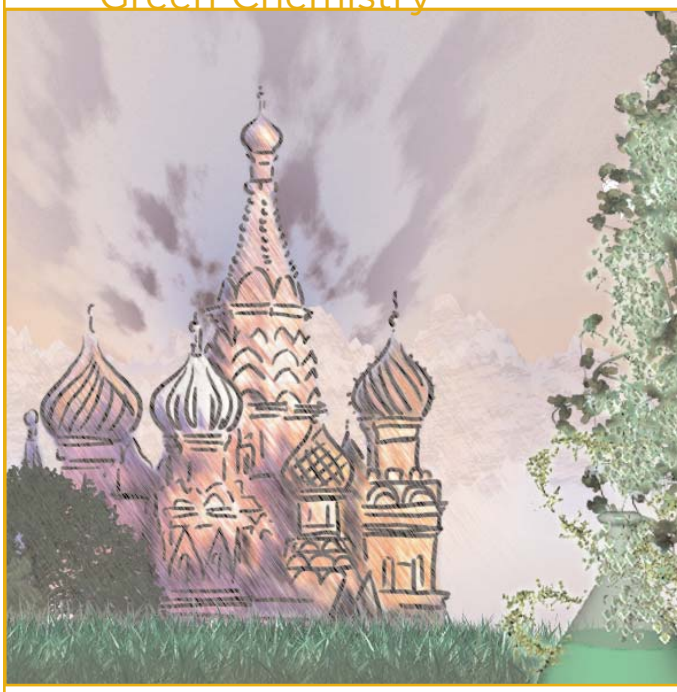
www.iupac.org/projects/2003/2003-043-1-300.html

Green Chemistry in Russia

Another project headed by Prof P. Tundo is aimed at increasing awareness and interest in green chemistry among university students and industrial chemists in Russia and the former Soviet republics. The aim of the project is to produce and disseminate a book like *Green Chemistry in Africa* or *Green Chemistry in Latin America*.

The field of green chemistry has received much attention from the scientific and industrial communities in almost every highly industrialized nation. It is understandable that the principles of green chemistry should generate strong interest in countries with high production capacities. One of these countries is Russia, which has a long history of chemical industry.



Unfortunately, that industry has resulted in a number of highly contaminated sites and hazardous and resource consuming production tools. Industrial development in Russia took place during Soviet times, when there was no concern about environmental issues.

Although there was a decrease in production capacity in Russia in the two last decades, the country's scientific and technological potential remained strong. The renaissance of Russian industry, which has been observed for the last several years, has been based in part on the principles of sustainability. A particular focus on chemistry resulted in a nationwide effort by the research community (which has historically been the driving force for innovation) to invent, develop, and popularize new "green" chemical processes.

The renaissance of Russian industry . . . has been based in part on the principles of stainability.

Even though not all the research directions to be reported in this book have found applications in industry, environmental protection, or elsewhere, the book will demonstrate that the ideology of green chemistry has never been hostile to Russian research and development. What is particularly important is that the book, which will be available in English, will share these innovations, for the first time with the foreign R&D community.

The book will deal with developments in the main regions of Russia: Central Russia, Northern Region, Siberia, Ural, and the Far East. Among the green chemistry innovations that will be described in the book are the following:

- the nucleophilic aromatic substitution of hydrogen reactions that are ecological alternatives to the commonly used methods of introduction of substituents to organic molecules
- de-NO_x reactions or SO_2 removal using new very effective catalysts containing transition metal cations
- new methods for transforming wood biomass to valuable products, based on examples from Siberian and Northern Russia woods
- new approaches to classifying humic substances and principles for using them for a number of chemical, agricultural, medical, and other purposes
- applications of ionic liquids for base-promoted reactions of CH-acids to obtain important agrochemical and medicinal products

The book will also address waste disposal and remediation problems and pollution control and monitoring. These issues are vital for Russia, where enormous amounts of PCBs are still stored and used in old electrical equipment. For example, some data have shown that even in relatively clean regions of Russia, there is contamination of human milk by dioxins.

We believe that the interesting and substantial material in this book will help many researchers, students, and people who are interested in the problems of environmental protection and safety, to obtain valuable information and perspectives on the development of green chemistry in Russia.

For more information, contact the Task Group Chairman Pietro Tundo <tundop@unive.it> or Valery Lunin <vvlunin@kge.msu.ru>.

www.iupac.org/projects/2003/2003-026-1-300.html

The aim of the IUPAC Subcommittee on Green Chemistry is to further the cause of green chemistry for the wider benefit of the chemistry community and society as whole. For more information regarding the Subcommittee visit its Web site.

www.iupac.org/divisions/III/303/index.html

The Impact of International Exchange

The Scientific Journey of Marini Bettolo from Italy to Uruguay

by Patrick Moyna

Chemistry has always been a science of intense international exchanges, and mentoring has been standard practice during all of its history. Even today we can trace the "descendants" of Perkin, Liebig, or Dumas. In spite of this, the efforts of countless visiting professors, traveling students, and others to advance chemistry in the Third World do not seem to demonstrate clear results. This can often discourage present-day chemists from making the personal effort and sacrifice of going abroad to educate others. However, I would like to convince colleagues of the usefulness of such visits by using the example of chemistry in Uruguay. This small Latin American country, which recently joined IUPAC as an ANAO (Nov-Dec 2002 *CI*, p. 4), has so simple a scientific history that the impact of visiting scientists can be directly observed.

Chemical studies in Uruguay developed in combination with pharmacy, an activity that was present since the last days of the Spanish Viceroyalty of the Rio de la Plata (early 1800s). After the establishment of the National University in 1849, pharmacy and chemistry teaching were incorporated into the Medical School in 1909, as a subsidiary Instituto de Quimica. Pharmacy and chemistry became an independent facultad (college) in 1929. Instruction in pharmacy and industrial chemistry was the basic activity at the college—research was practically nonexistent, and most "scholarly publications" were related to courses. This situation continued well into midcentury because of the relative isolation of South America and Uruguay during the Depression and later during World War II.

In 1948, after an extended scholarly visit to Chile, Prof. Giovanni B. Marini Bettolo, then a young Italian chemist, stopped in Montevideo to look after family affairs that had been long neglected because of the War. The visit was supposed to be short, but due to legal paperwork, the days became months. Dr. Marini Bettolo grew restless and visited the local Facultad de Quimica y Farmacia, and offered to teach an introductory course on chemical research. His offer was accepted, and from June 1948 until his return to Italy in October 1949, he taught a small group of young enthusiasts.

The whole effort could have ended then and there, but Dr. Marini Bettolo was keen on promoting his students, and invited and supported their visits to Europe. The initial group of Profs. M. R. Falco, J. A. Coch, S. Dittrich, and R. Sosa, started in Rome and then visited other institutions in Europe. All were all back in Montevideo by the late 1950s, where they went on to train a second group of chemists.

This photograph was taken during a 1961–62 visit of Dr. G. B. Marini Bettolo to Montevideo. From right to left, some of the people in the photo are 1. Prof. Simon Dittrich; 5. at the back, Prof. Alberto Coch; 6. at the front, Prof. Rodolfo Usera, Dean of the Facultad de Quimica, Montevideo 1960-64; 7. at the back, Prof. Dr. Bettolo; 9. at the back, Mrs. Dittrich; 11. Mrs. Falco; 12. Prof. Mario Falco, 15. at the front, Emilio Falco, son of Prof. Falco and now Prof. of Astronomy at Harvard.

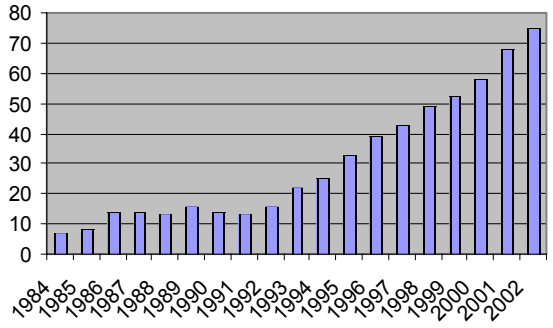
This second, larger group went to North America or Western Europe in the 1960s. The group managed to survive the disastrous military dictatorship (1973–1985) and, although a sizeable fraction never did return after emigrating, they all provided opportunities to third and fourth generations of students who have studied successfully either in Uruguay or abroad.

"Generations" of Marini Bettolo's Uruguayan Students

Scientist Name	Year of Birth	Year of Doctorate	Institution	Retirement
First Generation: 3 Ph.Ds completed in Montevideo, 1 abroad				
Prof. M. R. Falco	1922	1954	ETH (Zurich)	1982
Prof. J. A. Coch	1923	1969	Montevideo	1989 (emigrated 1975)
Prof. S. Dittrich	1923	1961	Montevideo	1990 (expelled 1977)
Prof. R. Sosa	1927	1971	Montevideo	1997
Second Generation: 3 Ph.Ds completed in Montevideo, 3 abroad				
Dr. J. X. DeVries	1932	1961	Montevideo	1974 (emigrated 1974)
Dr. W. Cervenansky	1930	1963	Montevideo	1974 (expelled 1974)
Dr. W. Diano	1930	1969	Exeter	2002
Dr. P. Moyna	1938	1968	Birmingham	active
Dr. T. Hirschfeld	1938	1976	Montevideo	1984 (deceased)
Dr. R. Lombardi	1939	1970	Paris	2001
Third and Fourth Generations: 1980-1990—2 completed Ph.Ds in Montevideo, 11 abroad 1990-2000—11 completed Ph.Ds in Montevideo, 23 abroad 2000-to date—10 completed Ph.Ds in Montevideo, 5 abroad				

This story could be limited to describing the accomplishments of the students as they advanced through their studies. However, it is more interesting to observe how Marini Bettolo's efforts affected the development of chemical research in Montevideo. In figure 1 we see the increase in the number of faculty with post-doctoral level experience at the Facultad de Quimica.

Figure 1: Staff of Facultad de Quimica with Doctorates



Figures 2 and 3 show the scientific productivity of faculty at the college, both in absolute numbers and relative to the total scientific production from Uruguay. To put these numbers in context, this level of productivity is achieved with a budget of just over 1 million U.S. dollars, which represents 3% of the total budget of the university. These funds have to cover all teaching, research, and other academic activities.

The professors at the Facultad who can trace their experience back to Marini Bettolo, have published their research in a range of fields such as organic chemistry and natural products, physical chemistry, theoretical studies, analytical chemistry, and immunology. The research-oriented approach that these professors learned has been followed by most of the staff, and now the groups in inorganic chemistry, microbiology, toxicology, clinical analysis, crystallography, parasitology, food chemistry, enology, and pharmacokinetics—that cover the whole spectrum of the Facultad—are also contributing to these results.

Figure 2: Total Publications from Facultad de Quimica in SCI(R)

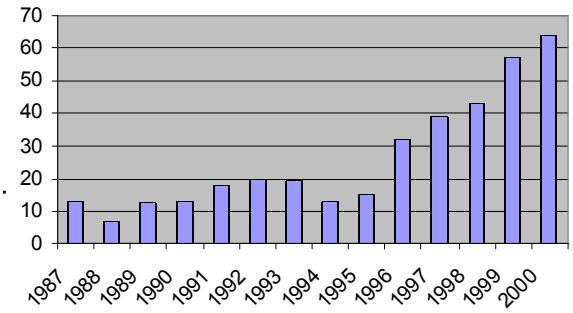
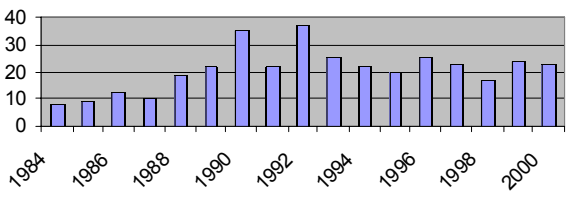


Figure 3: Percentage of Uruguayan Scientific Publications Originating from the Facultad de Quimica



So even though we chemists "know" about the former students of Profs. H. Wieland, D. H. R. Barton, R.

B. Woodward, or L. Ruzicka, we often have difficulty in seeing how they influenced the broad spectrum of chemistry. Here we have a clear example of the impact of one teacher on the growth of the chemical sciences in a whole country. Dr. Marini Bettolo was an outstanding chemist, but he was also an open-minded scientist, who did not hesitate to help younger colleagues from an obscure little country without imposing his own ideas or beliefs on them. He helped them without expecting a reward.

So, even if there is a chance that your efforts in another country will come to naught, there is a good possibility that they will be successful—resulting in growth for the chemical sciences worldwide and surely improved living conditions for people in some remote region. Not a bad legacy to leave behind.

Courtesy Mrs. G..B Marini Bettolo and son Prof. Rinaldo Marini Bettolo.

G. B. Marini Bettolo in 1948.

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Role Models in Chemistry

Jens Christian Skou

by Balazs Hargittai and István Hargittai

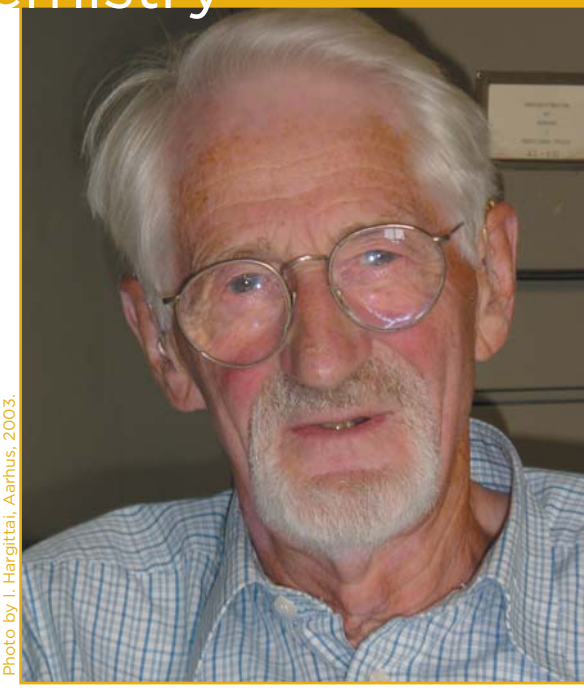


Photo by I. Hargittai, Aarhus, 2003.

Jens Christian Skou (b. 1918 in Lemvig, Denmark) is professor emeritus at the Department of Biophysics of the University of Aarhus, Denmark. He received half of the Nobel Prize in Chemistry in 1997 "for the first discovery of an ion-transporting enzyme, Na^+,K^+-ATPase." His story tells how scientific curiosity, persistent work, and international interactions bring a medical doctor working in a rather isolated place to a major discovery in biochemistry. Skou—who was training as a surgeon—wanted to understand the action mechanism of local anesthetics. His studies eventually led to the problems of transport of ions across cell membranes. This is an area of research, which is at the interface of chemistry and biology and has implications for the medical sciences.

Jens Christian Skou received his M.D. degree from the University of Copenhagen in 1944. He studied in the medical school when Denmark was under German occupation in the Second World War. That period had a lasting impact on his life. Members of his medical student group knew that one of the students was an informer for the Germans; unknown people liquidated him. Because of fear of revenge from the Gestapo against the group, teaching was cancelled. Many of Skou's teachers took part in the resistance against the Germans and they went underground or escaped to Sweden.

After graduation, Skou started his internship at a hospital in the northern part of Denmark. In the surgical ward the head of the department had escaped from the Gestapo to Sweden. The next in line in the department was anxious to teach him how to operate, which was unusual for someone who had just started his internship. Eventually Skou realized that the reason for this was that his superior surgeon was involved in receiving weapons from England delivered by plane at night. When they were on night duty together and the surgeon had to leave to receive weapons he wanted to be sure that Skou could take over. Skou also received his Doctor of Medical Sciences degree from the University of Copenhagen in 1954.

In order to understand the importance of professor Skou's discovery, we have to go back a little in science history. In the 1870s it was shown that there is a difference in the concentration of sodium and potassium inside and outside the cell. The potassium concentration is higher in the cell than outside while for the sodium concentration the reverse is the case. This was explained around 1913 in the following way. If the cell contains proteins, which cannot pass through the cell membrane and there is potassium chloride, which can pass through the cell membrane, the product of potassium and chloride concentrations in the cell will be equal to the product of potassium and chloride concentrations on the outside at equilibrium. But as there must be electro-neutrality on the inside, the concentration of potassium must be higher than the chloride concentration, because part of the potassium concentration is used to neutralize the protein negative charges. On the outside, the product consists of equal components. If there are two components in a product with unequal size, which is equal to a product of two components of equal size, then the sum of the two unequal components is higher than the sum of the two equal components. This means that there is a higher concentration of potassium + chloride inside than outside, which also means a higher osmotic pressure.

Furthermore, there are the proteins in the cell, which also adds to the osmotic pressure. Equilibrium can only be obtained if water is prevented from flowing in. As the cell membrane is permeable to water, the only way to establish the equilibrium is by adding some ions on the outside to compensate for the high osmotic pressure inside the cell, and that ion is sodium. That is why

the sodium concentration must be higher outside than inside. But why is sodium not distributed like potassium. The answer was that this is because the membrane is impermeable to sodium. But in l939, it was shown that the muscle membrane was permeable to sodium, and it was suggested that there are pumps in the membrane that pump sodium out (i.e., the distribution of sodium is not an equilibrium distribution but a steady state distribution that requires energy). In the following years it was shown that cell membrane permeability to sodium was a general phenomena.

Skou started his related research in the beginning of the 1950s. By then the existence of the ion pump in the cell membrane had been accepted, but it was not known what the nature of the pump was. While Skou was in the surgical ward, he became interested in the action mechanism of local anesthetics. He knew that for narcotics, which are neutral substances, there is a correlation between lipid solubility and narcotic potency. The local anesthetics are weak bases, which in aqueous solution dissociate into a water-soluble ionized part and a non-ionized part, which is lipid-soluble. Did a similar correlation between lipid solubility and anaesthetic potency exist for local anesthetics? Experiments showed that it did not and neither was there a correlation between the capillary activity and the potency of the local anesthetics.

At some point Skou realized that a phospholipid monolayer is similar to one half of the cell membrane, and that is why it could be used as a model of the water lipid interface of the cell membrane; the cell membrane is a double layer of phospholipids. He then used this model to test the effect of the local anesthetics. He observed that the local anesthetics when added to the waterphase underneath a monolayer of lipids extracted from peripheral nerves increased the pressure in the monolayer at a given area, indicating that they penetrated up into the monolayer. There was a correlation between the ability to increase the pressure in the monolayer and the blocking potency of the local anesthetics.

These results sufficed for Skou to write up his Danish thesis and publish six papers in English. At this point, he could have stopped research, but his curiosity did not let him stop. He wanted to determine what the connection was between the penetration and pressure increase in the monolayer and the blocking of the nerve impulse. The local anaesthetic in blocking concentrations had no effect on the membrane potential. Skou thought it was possible that the local anaesthetic—by the pressure increase—blocked the opening of the membrane for sodium, thereby stopping the influx of sodium and, consequently, the initiation of the nerve impulse.

Skou thought that a protein—through a change in its conformation—was responsible for opening the nerve membrane for sodium and that the local anaesthetic, by penetrating into the membrane, blocked the conformational change. In order to show this, he thought that the protein should be incorporated into a monolayer of lipids and then a local anaesthetic should be added to the water phase so it could be determined whether the penetration into the monolayer had an influence on the conformation.

A problem was that the protein responsible for the opening of the nerve membrane for sodium was unknown, and that no methods existed for measuring conformations of proteins in a monolayer. Instead, he decided to use a protein with enzymatic activity, incorporate this in a lipid monolayer, add local anesthetics to the water phase, and see if penetration up into the monolayer had an influence on the enzymatic activity, and take this as an indication of an effect on the conformation. He had to find an enzyme with a high turnover number, as the amount of protein he could

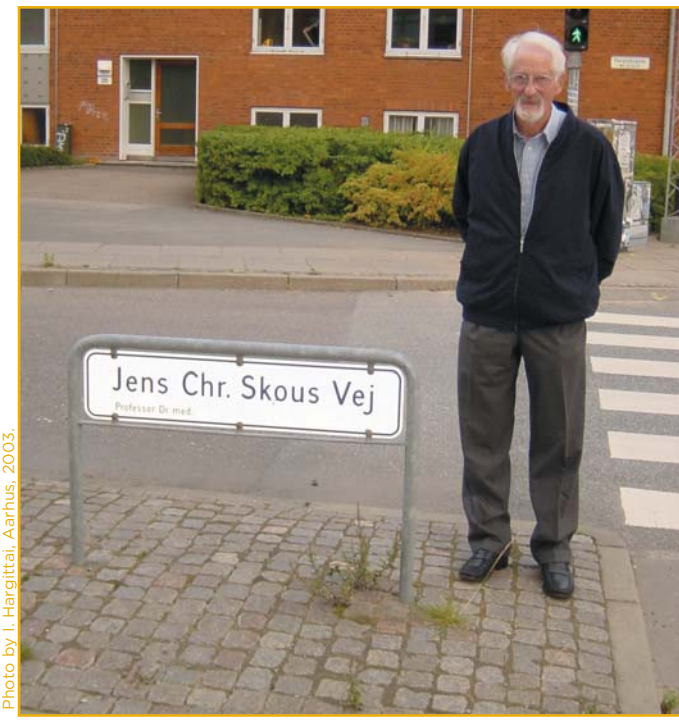


Photo by I. Hargittai, Aarhus, 2003.

Jens Christian Skou standing next to the street sign that bears his name in Aarhus, Denmark.

incorporate into a monolayer was very limited, and if possible an enzyme that was membrane bound. One of his candidates was acetylcholinesterase. It is a membrane bound protein, which is prepared from the electric organ of the electric eel. Skou had no access to electric eels, but he knew that David Nachmansohn, a former refugee from Nazi Germany, now at Columbia University, prepared the enzyme from electric eels. Skou spent two months with Nachmansohn in 1953, the first month in Woods Hole and the second in New York City.

Woods Hole . . . was where [Skou] realized for the first time that science was a serious affair and not just a hobby.

Woods Hole turned out to be a great experience for Skou. It was where he realized for the first time that science was a serious affair and not just a hobby. In contrast to Woods Hole, Aarhus was a 19-year old university then, and Skou's department consisted of three young doctors with no scientific background who were trying to do research. At Woods Hole, he encountered such giants of science as Albert Szent-Györgyi, Severo Ochoa, George Wald, and others. Scientists interested in neurophysiology came from all over the world to work there in the summer time, because there was access to squids and their giant axons, nerve fibers with a diameter of 0.5–1 mm, which were very useful for neurophysiological experiments.

Jens Skou and his wife skiiing.

Skou read in a book by Nachmansohn that in 1948 Libet had shown that there is an ATP hydrolyzing enzyme in the membranes of the giant axons, an ATPase. He knew that ATP is the energy source in cells and wondered what was the function of an ATP hydrolyzing enzyme in the nerve membrane. Furthermore, being in the membrane it had to be a lipoprotein, and that was what he needed for his monolayer experiments. He decided to take a look at the enzyme when he returned to Aarhus. In September, in New York, he prepared acetylcholinesterase.

Upon his return home he prepared monolayers of the acetylcholinesterase and measured the enzymatic activity in the monolayer, and observed that the enzymatic activity of the monolayer was pressure dependent. The next step was to prepare a phospholipid monolayer containing the protein and to see if the addition of local anesthetics to the water phase could influence the enzymatic activity. But before doing this he wanted to take a look at the nerve membrane ATPase.

He had no access to giant axons, but used membranes from crab leg nerves instead. A fisherman sent him some 200 small crabs every week and he used several thousand crabs before the study was over. Skou had two laboratory assistants pull the nerves out of the legs. A problem was how to kill the crabs. They started with a hammer, but this led to crab pieces all over the room. At the end, they cut the legs with a sharp pair of scissors above a big pot with boiling water and dumped the crabs into the pot, which killed them immediately. The procedure gave them another problem—the smell of boiled crabs. One could easily locate the Institute of Medical Physiology on the campus of Aarhus University based on its smell alone. Today such experiments might not be tolerated.

Skou at that point entered a frustrating period in his research. The membrane pieces from the crab nerves contained—as described for the giant axon—an enzyme that hydrolyzed ATP in the presence of magnesium, but the activity was low; and the addition of potassium had no effect, while sodium gave a slight increase. Further experiments gave, however, varying results, with some times higher and some times lower activity. This went on for a year and a half. He needed enormous stamina not to give up. Opportunities came up for clinical jobs and at one point Skou decided to take up such an appointment, but his wife knew him better and suggested that he stay at the university.

As it turned out, eventually Skou discovered that the enzyme required a combined effect of sodium and potassium for activity. This was an unexpected surprise, and it explained the varying results, which were due to varying concentrations of the two cations in the test

tube, which came from buffers and the solutions used for the preparation of the membranes. As the first experiments had shown no effect from potassium and little effect from sodium, the concentration of these cations in the medium had not been controlled.

Skou was interested in the effect of local anesthetics on the nerve conduction. As the nerve conduction is related to the opening and closing of the nerve membrane for sodium, followed by an opening for potassium, his first reaction was that the enzyme, which was influenced by a combined effect of sodium and potassium, was related to this change in permeability for sodium and potassium, and that it was a channel in the nerve membrane. But as the change in permeability of the nerve membrane was voltage dependent, and the enzyme activity was ATP dependent, he came to the conclusion that the enzyme was part of or the sodium pump.

He published his findings in a paper titled "The Influence of Some Cations on an Adenosine Triphosphatase from Peripheral Nerves" [Skou, *Biochimica et Biophysica* 1957, 23, 394]. He ended the paper by saying that the crab nerve ATPase seems to fulfill a number of the conditions that must be imposed on an enzyme, which is thought to be involved in the active extrusion of sodium from the nerve fiber. This was the paper that was the principal basis for his Nobel Prize. However, the paper had only limited immediate impact.

It was again the international interactions that gave a decisive push to his career. In 1958, he took part in an international biochemistry conference in Vienna, Austria. There he renewed his contacts forged some years before in Woods Hole. One of the discussions gave him a clue to a chemical test that would unambiguously demonstrate that the ATPase he worked with was the sodium pump. He also found out that the crucial observation was the combined effect of the potassium and sodium cations.

Gradually Skou's discovery spread and when he visited the United States in 1963, the editor of *Physiological Review* asked him to prepare a review article on the ATPase, which was published in 1965 [Skou, *Physiol. Rev.* 1965, 45, 596]. The article provided all the evidence that this enzyme had all the characteristics needed for it to be the sodium pump. It was named the Na^+,K^+-ATPase.

From his seminal 1957 paper, the Nobel recognition took 40 years. During that time, Skou diligently worked on the enzyme. He was mostly working alone and most of his papers carry his name as the sole author. After his 1965 paper, however, he had more visibility and more co-workers. Although tremendous progress has been made, Skou stressed in his Nobel lecture that the molecular basis of the action mechanism of the ATPase pump is not yet fully understood.

Professor Skou never thought of the Nobel Prize and it came to him as a surprise. He was happy that his field was selected, but was disappointed that the two other major figures, I. M. Glynn of Cambridge, England, who had made important contributions to the development of the concept of active transport, and Robert Post of Nashville, Tennessee, who had done very important work for the understanding of the involvement of the Na^+,K^+-ATPase in active transport, were not included. The Nobel recognition came late in Skou's life and did not disrupt the creative period of his activities. It took him two full years to deal with its consequences, the celebrations, lectures, interviews, answering fan mail, etc. Of course, there was tremendous press coverage of the prize in Denmark and the University of Aarhus also benefited from the recognition.

Today, Skou is deeply concerned about the funding system in science. He thinks that it hinders the development of young, independent scientists who would have original ideas to pursue. The funding system favors those who are already in secure position and it leaves little room for new thinking. The present funding system may lead to the loss of new initiatives and almost ensures mediocrity. In Denmark, Skou has been very vocal about the need for a better funding system to support basic research, especially to provide the opportunity for young people to work on their ideas. He has become sort of a politician, in a way following in the footsteps of his wife, Ellen-Margrethe, who has been active in county politics for a long time.

From his seminal 1957 paper, the Nobel recognition took 40 years.

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

*Jens C. Skou's opening Nobel Lecture on 8 December 1997 <www.nobel.se/chemistry/laureates/1997/skou-lecture.html>.

IUPAC Officers Meet with Chemistry Leaders in Kazan

As mentioned by President Steyn in the President's Column in the Nov-Dec 2003 *CI*, there is a strong desire in the republics of the former Soviet Union to renew contact with IUPAC and become involved in various IUPAC activities. Discussions to this effect were held among IUPAC President Steyn and Vice President Sydnes and chemistry leaders from the republics during the XVII Mendeleev Congress held in Kazan in September 2003. At the roundtable discussion, officially titled the State and Development of Chemical Science in the Former Soviet Union Countries, it became clear that the financial situation in the republics is so difficult that extraordinary measures should be taken to facilitate their participation in IUPAC initiatives and projects.

At the end of the meeting the participants were not in a position to outline a clear action plan for the future. However, progress was made on several of the items raised. The following summary reflects the major issues discussed.

The Chemistry Clearing House project, which was proposed by dedicated chemists in Moscow and aims to become an important component of chemical education in Russia, would like to involve chemists from the other republics. The chemical community in each of the republics should come forward with names of one or several chemists who would like to become involved in the project and contact the task-group leader to get started <www.iupac.org/projects/2001/2001-003-5-050.html>.

Since it will be next to impossible for most of the republics to pay the full membership fee for National Adhering Organization status, for the time being, the republics were advised by IUPAC officers to opt for associate membership, also known as Associate National Adhering Organization (ANAO) status.* Discussions on full membership could be pursued later. Estonia, Latvia, and Ukraine are already ANAOs; only Russia is now an NAO. (see Jan-Feb 2003 *CI,* p. 10) An alternative solution discussed at the roundtable was to establish a *regional chemical society*, which could then apply for membership in IUPAC. IUPAC representatives promised to discuss the proposal as soon as possible.

IUPAC supports a number of initiatives (e.g., conferences) of chemists in emerging and developing countries that are members of IUPAC. If the republics were to opt for associate membership in IUPAC, they would be able to benefit from some of this funding.

From the discussions it emerged that there was too little knowledge about IUPAC in the chemistry community in most of the republics. The suggestion was made that a meeting between the IUPAC president and the chemistry community (representatives from the chemistry society and the national Academy) in the republics would be most fruitful. As president-elect Sydnes has indicated he would be more than willing to visit the republics, provided dates could be found and programs could be worked out.

As a result of the meeting, the IUPAC officers understand the difficult situation being experienced by the republics emerging from the former Soviet Union, and realize that the union has to take a fresh look at its relationship with these countries.

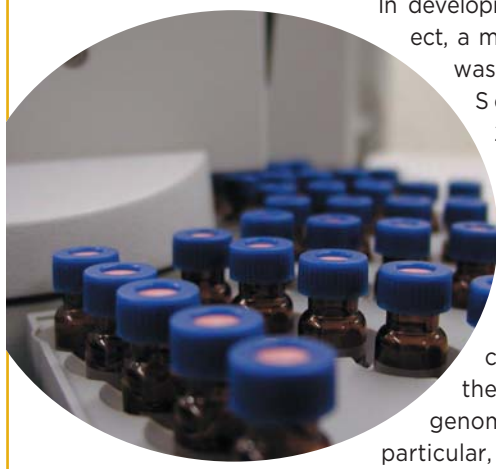
*Generally speaking, ANAOs have observer status in IUPAC. An ANAO may be a national chemical council, a national society representing chemistry, a national academy of science, or any other institution or association of institutions representative of national chemical interests.

Countries of the Former Soviet Union Represented at the Roundtable Discussion

Post Genomic Chemistry

More than 20 specialists from 11 countries (Belgium, Canada, Estonia, France, Germany, Italy, Poland, Russia, Sweden, UK, and USA) actively participated in an interdisciplinary project on post genomic chemistry. In developing this project, scientists joined forces from the fields of structural chemistry, biopolymer science, synthetic chemistry, drug design, and bio-inorganic and bio-analytical chemistry.

These scientists prepared a technical project report, which has been submitted to *Pure and Applied Chemistry* for publication, based on their published research from the last two to three years in journals such as *Nature*, *Science*, *Journal of American Chemical Society*, *Journal of Analytical Chemistry*, *Journal of Molecular Catalysis*, and others.



In developing this project, a mini-workshop was held 6–8 September 2003 in Moscow, which allowed experts to exchange views on chemistry in the post genomic era. In particular, they discussed the implication of advances in genomics, proteomics, biomimetics, and biological and chemical informatics. Such advances involve combinatorial chemistry and automated chemical synthesis, synthesis of new classes of unnatural amino acids, development of new biosynthesis methods for preparation of proteins containing unnatural amino acids, chemical management of biosystems at the molecular level, and self-multiplying polymers.

In deciding on the project objectives, this group of scientists was influenced by a number of different conferences and seminars. Great interest was generated in particular by a plenary lecture on "Post Genomic Chemistry: New Possibilities and New Challenges" presented at the 17th International Mendeleev Congress on Pure and Applied Chemistry (September 2003, Kazan).

The development of this project revealed the necessity of creating new educational programs and training courses for chemistry students and faculty on the chemical basis of genomics. Such courses could include the chemical basis for genomic studies, genes and genomes for chemists, and bio- and chemo-informatics.

Financial support for the project was provided by IUPAC and the "Biocatalysis and Biocatalytical Technologies" project of the Ministry of Science and Technology of the Russian Federation.

For more information, contact the Task Group Chairman Sergey D. Varfolomeyev <sdvarf@enzyme.chem.msu.ru>.

www.iupac.org/projects/2001/2001-005-1-300.html

Analog-Based Drug Discovery

The Chemistry and Human Health Division Committee has reviewed the project proposal Analog-Based Drug Discovery and has approved the project as one of the divisional activities. The international teamwork started in January 2003. The project is part of the work of the Subcommittee on Medicinal Chemistry and Drug Development.

Analogs of drugs play an important role in the evolution of drug discoveries. Statistically, every second drug is an analog, therefore, it is of interest to analyze the relationship of these drugs to the pioneer discoveries and to each other.

The goal of this project is publication of a reference book for medicinal chemists and students that provides an easily usable overview of drug-analogs and their role in medicinal chemistry.

The book will consist of the following chapters, to be written by the persons listed:

- Introduction (Robin Ganellin)
- Optimizing Drug Therapy by Analogs (Janos Fischer)
- Analogs as Means of Discovering New Drugs (Camille G. Wermuth)
- Drug Likeness and Analog-Based Drug Discovery (John Proudfoot)
- Case Studies
  - —Lacidipine (Giovanni Gaviraghi)
  - —Pantoprazole (Jorg Senn-Bilfinger)
  - —Esomeprazole (Per Lindberg)
  - —Moxifloxacin (Uwe Petersen)
  - —Azithromycin (Miljenko Dumic)
  - —Drospirenone (Rudolf Wiechert)
  - —Bisphosphonates (Eli Breuer)
  - —Glucocorticoids (Zoltan Tuba)
- Table of Drug-Analogs (Janos Fischer)
- Subject Index

According to the schedule, the final manuscript will be ready by 30 June 2004. Proposals and further case studies are welcome.

For more information, contact the Task Group Chairman Janos Fischer <j.fischer@richter.hu>.

www.iupac.org/projects/2002/2002-051-1-700.html

Glossary for Chemists of Terms Used in Toxicology—Revision and Updating

Toxicology is a subject area dependent on good chemistry and that influences chemistry through its impact on legislation for chemical safety. For the development of both, it is essential that toxicologists should be able to communicate with chemists and that there should be a clear, common understanding of the meanings of key terms. This was recognized in 1993 when IUPAC published a "Glossary for Chemists of Terms Used in Toxicology" as an official recommendation in *Pure and Applied Chemistry*, and prepared for publication by J. H. Duffus.

The glossary was widely recognized as authoritative. In fact, it was adopted by the U. S. National Institutes of Health as the glossary for its TOXNET Web site. Since this Web site is now being updated, J. H. Duffus was asked if the existing glossary could be revised and brought up to date so that it could be incorporated into a new educational part of the site. Revision is necessary since toxicology has developed considerably in the 11 years since the glossary was first published. Already the need for a current glossary in toxicokinetics has been recognized by IUPAC in another project (project number #2000-034-2-700), which also be involved in the revision. It is proposed, as before, to seek input widely from international authorities, including the International Union of Toxicology. It is envisaged that the glossary in its revised version will cover all key terms relevant to toxicology in one source document making for ease of use. The terminology of risk assessment will also be included since application of toxicology in risk assessment is one of its most important uses.

For more information, contact the Task Group Chairman John H. Duffus <j.h.duffus@blueyonder.co.uk>.

www.iupac.org/projects/2003/2003-028-1-700.html

Structure and Properties of Polymer/Clay Nano-Composite Materials

Recent developments in the technology of inserting (intercalating) polymer chains in nano-scale layers of clay have produced new types of high-performance polymer composites. However, the effects of the higher order structure on mechanical properties are not yet well understood. For example, little is known about the crystallization of polymer chains confined in the nano-scale layers and subsequently occurring morphology formation. Since mechanical properties of the composites are strongly affected by the higher order structure, the control of the higher order structure becomes a key technology to design nano-composites with excellent performance and/or functions.

Barrier properties of the composite to various gas molecules are greatly improved by the exfoliated structure that occurs when the clay layers are completely separated by the polymer chain and the clay sheets in the nano-scale are dispersed throughout the polymer matrix. Only a small amount of clay is needed to reduce drastically the permeability of the nanocomposite to oxygen and carbon dioxide. The composite could be used in food packaging applications, such as beer containers.

The purpose of this study is to clarify the relation-

Polymer/Clay Nano-composites could be used in food packaging applications such as beer cans.

ship between the higher order structure and properties of commercially available nano-composites composed of polyamide, PMMA, and clay. The topics cover a wide range of research from characterization of the components through physical properties in the solid state. Rheological properties of the melts are also an important topic related to the processability of the composites. In this project, several commercial grade nano-composites comprising polyamide/clay, PMMA/clay will be evaluated. The following topics will be covered in the study:

1. **Morphology and Crystallization Behavior:** Morphology and crystallization behavior will be analyzed by wide angle x-ray diffraction, small angle x-ray scattering, differential scanning calorimetry, polarized optical microscopy, transmission electron microscopy, and atomic force microscopy measurements.
2. **Rheological Properties of the Melts:** Dynamic visoco-elasticity, stress relaxation, shear and elongational flow properties will be measured.
3. **Mechanical Properties in the Solid State:** Stress-strain behavior, stress relaxation, creep, dynamic mechanical properties, impact strength, fatigue behavior, and micromechanics/fracture analysis will be conducted.
4. **Gas Permeability:** Oxygen and carbon dioxide permeability will be correlated to the high order structure of the composite evaluated through the morphology analysis.

The polymer/clay nano-composites with high modulus, high strength and gas barrier properties have a wide range of applications. With the dispersion of nano-scale plates of clay with high aspect ratio, enhanced mechanical properties as well as the barrier properties can be obtained with only a small amount of clay. Critical evaluation of the structure and properties will allow industry to expand the application of these new types of materials.

Three to five publications in *Pure and Applied Chemistry* are expected as a result of this project.

Any person who has information to contribute to the project, please contact the Task Group Chairmen Sung Chul Kim <kimsc@kaist.ac.kr> or K. Nitta <nitta@jaist.ac.jp>.

www.iupac.org/projects/2003/2003-051-1-400.html

Postgraduate Course in Polymer Science

Every year since 1996, the Institute of Macromolecular Chemistry of the Academy of Sciences of the Czech Republic in Prague, Czech Republic, has offered the Postgraduate Course in Polymer Science. The course, organized under the auspices of UNESCO and IUPAC, is intended primarily for young scientists with M.Sc. or Ph.D. degrees in polymer science or a related discipline, who are from countries with limited facilities for research.

The course lasts 10 months and comprises about 50 hours of lectures in modern polymer science, and a few hours of the basics of chemical English and principles of macromolecular nomenclature according to IUPAC recommendations. Most of the time is devoted to work on topical research projects under the supervision of senior scientists. The participants exploit all modern experimental facilities of the Institute. The results of their work are published in international technical journals and presented at technical meetings.

The graduates of the course are authors or co-authors of about 60 papers published in international technical journals and 70 communications at international meetings; See <www.iupac.org/projects/1999/1999-029-1-400.html>

So far, 62 participants from the following countries attended or are attending the course: Bulgaria, India, Kazakhstan, Poland, Romania, Russia, South Africa, Ukraine, and Uzbekistan. Follow-up shows that graduation from the course has been very helpful to professional promotion of the graduates in their home countries.

For more information, contact the Task Group Chairman Pavel Kratochvil <krat@imc.cas.cz>.

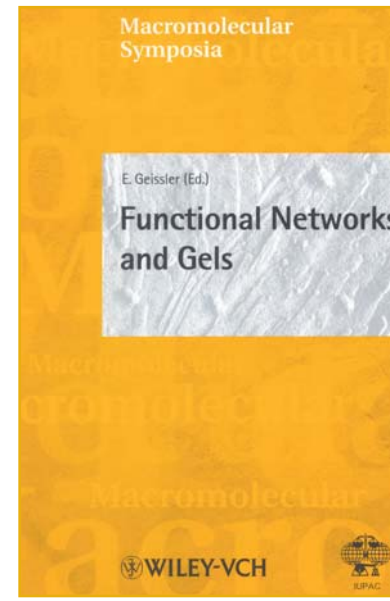
www.iupac.org/projects/2003/2003-041-1-400.html

Functional Networks and Gels

E. Geissler (ed.)
Macromolecular Symposia, Vol. 200
Wiley-VCH, 2003, pp. 1–296
ISBN 3-527-30704-4

This volume of *Macromolecular Symposia* contains papers presented at Polymer Networks 2002, the 16th Polymer Networks Group Meeting, held in Autrans, France, from 2 to 6 September 2002.

The contents of this volume are a reflection of the topics of the conference, the central theme of which was Functional Networks and Gels. Theoretical papers address such questions as photo-contraction, gels in contact with surfaces, and hyperelasticity in filled networks, as well as formation and structure-property relationships of networks and gels, including modeling approaches. Several experimental papers are devoted to the changes in the properties due to filler effects and to the osmotic behavior of special networks. Functional network topics covered in the contributions are wide-ranging, dealing with encapsulation of magnetic and conducting moieties in networks, biological and biomedical applications of reversible physical gels, high-swelling networks for use as super-absorbing materials, and environmentally responsive hydrogels.

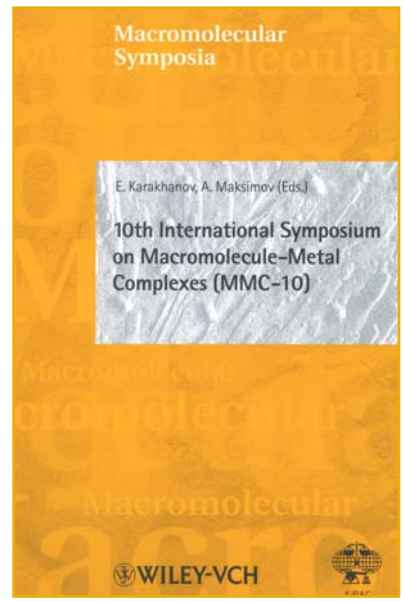


www.iupac.org/publications/macro/2003/200_preface.html

Macromolecule-Metal Complexes

E. Karakhanov and A. Maksimov (eds.)
Macromolecular Symposia, Vol. 204
Wiley-VCH, 2003, pp. 1–294
ISBN 3-527-30708-7

The issue of *Macromolecular Symposia* contains plenary and invited lectures delivered at the 10th IUPAC International Symposium on Macromolecule-Metal Complexes (MMC-10), which took place from 18–23 May 2003 in a boat traveling from Moscow along the Volga river. The first International symposium on Macromolecule-Metal Complexes was organized in 1985 in Beijing. The series of MMC symposia have been held every two years in a variety of locations all over the world (Italy, Germany, China, Netherlands, Japan, USA).



This symposium provides an international forum for presentation and discussion about the most recent progress and future trends in the rapidly expanding interdisciplinary field of macromolecular metal complexes. The symposium was focused on the role of metal ions, complexes, and clusters in macromolecular systems.

One hundred and twenty participants from 15 countries and 4 continents attended MMC-10. In addition to 6 plenary and 18 invited lectures, contributed papers were presented in 18 oral contributions and 64 posters. The scientific program of the 10th symposium was centered around a number of fundamental and applied topics such as: fundamental aspects of macromolecule metal complexes (synthesis, structure, properties), electron and photonic transfer, catalysis and separation processes, supramolecules, dendrimers, molecular recognition, metal ion conductive polymers, and environmental application of MMC. Plenary and invited lectures covered each topic of the symposium, providing an excellent foundation for the discussions and certainly serving as hints for further developments in the field of macromolecular metal complexes.

www.iupac.org/publications/macro/2003/204_preface.html

Mission and Challenges of Polymer Science and Technology

K. Horie and A. Abe (eds.)
Macromolecular Symposia, Vol. 201
Wiley-VCH, 2003, pp. 1–326
ISBN 3-527-30705-2

The IUPAC Polymer Conference on the Mission and Challenge of Polymer Science and Technology (IUPAC PC2002) was held as the first strategic symposium of the IUPAC Macromolecular Division (MMD) from 2 to 5 December 2002 at the Kyoto International Conference Hall. The goal of the conference was to determine the present status of polymer science and technology and clarify goals and future challenges. The conference was attended by 762 participants from 29 countries. Four plenary and 41 invited lectures were presented.

This volume of *Macromolecular Symposia* contains invited lectures, which are published in the same order as they were presented in the original program of the conference. Plenary lectures and a keynote article from the conference were published in *Pure and Applied Chemistry* (Vol. 74, No. 10).

The scientific program consisted of plenary lectures, six scientific oral and poster sessions, and a panel discussion summarizing the conference and discussing the role and activities of IUPAC MMD in the world polymer community. There were six themes arranged from a strategic viewpoint for the conference:

- Polymer Concepts in Chemistry, Physics, and Biology
- Frontiers of Polymer Science
- Advanced and Emerging Polymer Technologies
- State of the Art in "Bio-Polymers"
- Polymers and the Environment
- Commodity Polymers and the World Economy

www.iupac.org/publications/macro/2003/201_preface.html

Internet Connection

IUPAC Solubility Data on the Internet

A database containing solubilities originally published in the International Union for Pure and Applied Chemistry-National Institute of Standards and Technology (NIST) Solubility Data Series is now available at no cost online at <http://srdata.nist.gov/solubility>. This database, which is of significant value to analytical chemists, engineers, health scientists, and environmentalists, is derived from 11 volumes of the series and is concerned primarily with liquid-liquid systems. A limited number of multi-component (organic-water-salt) systems are also included.

Typical solvents and solutes include water, seawater, heavy water, inorganic compounds, and a variety of organic compounds such as hydrocarbons, halogenated hydrocarbons, alcohols, acids, esters, and nitrogen compounds. For many systems, sufficient data were available to allow critical evaluation.

About NIST and the Solubility Data Series

IUPAC's *Solubility Data Series* (*SDS*), begun in the mid-1970s, is an exhaustive compilation and critical evaluation of all the world's published results of experimental determinations of solubility. Since 1979, over 70 *SDS* volumes have been published, including evaluated data on the solubility of gases in liquids, liquids in liquids, and solids in liquids. These volumes represent one of the largest collections of chemical property data ever produced and are the result of the work of scientists throughout the world.

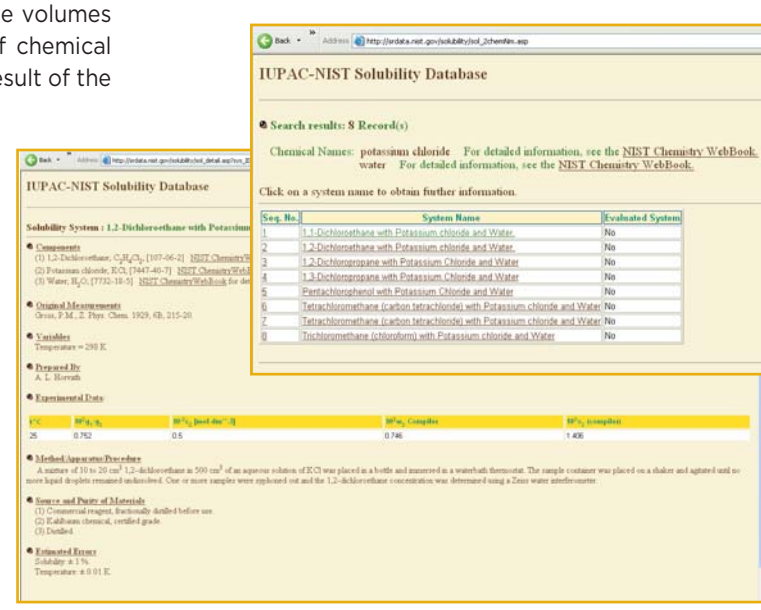
With the explosion of Web-based chemical information resources, IUPAC and NIST began discussions about how best to make the contents of the *SDS* available online and in 1999 concluded an agreement to achieve this. Over 70 printed volumes have been printed, many of which are not available in computerized format. This first subset to be made available online deals with the solubility of liquids in liquids and covers these 11 volumes:

- SDS 20 "Halogenated Benzenes, Toluenes and Phenols with Water" (1985)
- SDS 37-38 "Hydrocarbons in Water and Seawater, Parts I-II" (1989)
- SDS 58-59 "Polycyclic Aromatic Hydrocarbons: Binary Non-aqueous Systems, Parts I-II" (1995)
- SDS 60 "Halogenated Methanes with Water" (1995)
- SDS 67 "Halogenated Ethanes and Ethenes with Water" (1999)
- SDS 68 "Halogenated Aliphatic Compounds C3-C14 with Water" (1999)
- SDS 69 "Ternary Alcohol-Hydrocarbon-Water Systems" (1999)
- SDS 71 "Binary Nitromethane Systems" (2000)
- SDS 77 "C2 + Nitroalkanes with Water or Organic Solvents: Binary and Multicomponent Systems" (2002)

Scope

The IUPAC-NIST Web site allows users to examine over 3600 multi-component systems containing over 1000 chemical substances. Many of the systems (over 338) have been critically evaluated. For these, the Web site presents reported numbers and best value data in tables, along with data correlation equations and graphical summaries. All of the critical evaluations include pertinent references taken from the compilation sheets. The database has over 800 references for the critical evaluations that can be searched for on the site. Chemical component searches are also supported, as well as system searches.

http://srdata.nist.gov/solubility/



Flow Analysis

by I. D. McKelvie

The **Ninth International Conference on Flow Analysis** was held from 17–21 February 2003 at Deakin University in Geelong, SE Australia, under the aegis of the Analytical Chemistry Division of the Royal Australian Chemical Institute.

The first International Conference on Flow Analysis was held in Amsterdam in 1979 in response to the renaissance in flow analysis techniques that followed the development of flow injection analysis by Hansen and Ruzicka in 1974. Subsequent flow analysis conferences have been held in Lund (1982), Birmingham (1985), Las Vegas (1988), Kumamoto (1991), Toledo (1994), Piracicaba (1997), and Warsaw (2000), and all have reflected the excitement, enthusiasm, and ingenuity of researchers, practitioners, and manufacturers in flow-based analysis.

Of the 117 delegates who attended the Australian meeting, 77 traveled from overseas. These attendees, including large contingents from Thailand and Portugal, represented more than 20 countries.

The opening address of the conference was given by Professor Gary Christian ("The Role and Importance of Flow Analysis in Analytical Science"), who traced the history of the flow analysis meetings, and argued the importance of flow analysis in the field of analytical science.

The scientific program that followed included 5 plenary lectures, 5 invited lectures, 38 contributed papers, and 82 poster presentations, covering a wide range of detection and sample preparation techniques in environmental, process, clinical, and food and beverage analysis. Prof. Paul Worsfold (Univ. of Plymouth, UK), as the first of the plenary lecturers, illustrated this in his address on the development and use of spectrophotometric and chemiluminescent flow systems for shipboard measurements in marine and estuarine environments. Ivano Gutz (Univ. Sao Paulo) gave an energetic lecture on the non-detection, sample modification applications of electrochemistry, while Peter Hauser (Univ. Basel, Switzerland) gave a systematic description of electrochemical detection in flow analysis.

Miniaturization of flow systems was a hot topic. Gillian Greenway (Univ. Hull, UK) described her experiences with Lab-on-a-Chip, noting that this approach had enormous promise. However, there is a need to fully understand the sensing and separation processes at a molecular level if this approach is to reach its potential. Dermot Diamond (Dublin City Univ. Ireland) continued in this vein. He described the burgeoning development of wireless networked sensors, and raised the challenge of developing robust microfluidic sensing systems that could operate for more than a year with reagent consumption of less than 100 mL!

Plenary and invited speakers and members of the Australian Organising committee (photo: Donna Edwards, Deakin Photography). Front row (L to R): Daryl Tucker, Paul Worsfold, Ian McKelvie, Gary Christian, Dermot Diamond, Alan Townshend, Elo Hansen. Middle Row: Gillian Greenway, Bob Cattrall, Sandy Dasgupta, Ivano Gutz, Simon Lewis, Neil Barnett, Amanda Lyddy-Meaney. Back Row: Ari Ivaska, Terry Elms, Spas Kolev, Stuart Chalk, Peter Hauser, Ben Hindson, Graham Marshall.

Ben Hindson (Lawrence Livermore National Laboratory, USA) emphasized the importance of on-line flow analysis systems in his invited lecture on the development of a microbead sequential injection analysis immunoassay system for screening for bio-warfare agents and air monitoring in public places.

Graham Marshall (GlobalFIA, USA) described the limitations of conventional pumping and injection systems, and argued the case for a new generation of "zone fluidic" flow systems that overcome many of the limitations of laboratory based flow systems. Ari Ivaska èbo (Univ. Finland) continued this theme in his talk on the applications of SIA in process monitoring in the steel and paper industries. Sandy Dasgupta, ever the showman, gave a stunning video and musical illustration of the versatility and aesthetics of microfluidic manipulations. The scientific program finished on an upbeat note with a concluding plenary lecture by Alan Townshend (Univ. Hull, UK) entitled "Solid Phase Reactors and Liquid Phase Emitters—

Some Success Stories in Flow Injecdtion Analysis."

One of the highlights of the conference banquet was an occasional address by Prof Elo Hansen (Technical University of Denmark), co-inventor of flow injection analysis ("Flow Injection Analysis: How It Was Conceived, Developed, and Succeeded—Despite All Odds") in which he described something of the excitement and frustrations from the early days of FIA.

Scientific presentations at the conference were notable for their very high standard, and the judges had a difficult task in deciding the four student awards. These were ultimately presented at the dinner to Ms. Sumalee Tanikkul (Thailand), Ms. Weena Siangproh (Thailand), Ms. Nuanlaor Rattanawimarnwong (Thailand), and Ms. Amanda Lyddy-Meaney (Australia) by the international judging panel (Professors Bo Karlberg, Shoji Motomizu, and Tadao Sakai). The proceedings of Flow Analysis IX will be published in *Analytica Chimica Acta* in late 2003. Flow Analysis X will be held in 2006 in Oporto, Portugal.

Ian McKelvie <ian.mckelvie@sci.monash.edu.au>, chair of Flow Analysis IX, is associate head (Teaching), School of Chemistry, Monash University, Australia.

Organic Chemistry

by Andreja Lesac

The **13th European Symposium on Organic Chemistry** (ESOC) was held in the picturesque small town of Cavtat (near Dubrovnik), Croatia, from 10–15 September 2003. The symposium provided a forum for scientists working in all fields of organic chemistry. This international meeting is biennial, and in keeping with its tradition covered new developments in organic chemistry, including synthesis, catalysis, physical organic chemistry, supramolecular chemistry, chemical biology, and new organic materials. ESOC 13 attracted 455 active participants from 40 different countries.

The scientific program embraced all aspects of organic chemistry. There were 13 plenary lectures:

- J. A. Gladysz, Friedrich-Alexander-University, Erlangen, Germany, on "Carbon-Based Molecular Wires"
- G. C. Lloyd-Jones, University of Bristol, UK, on "Hydrogen Bonding in the First Generation Proton Sponges"
- P. Beletskaya, Lomonosov Moscow State University, Russia, on "Transition Metal Catalysed Reactions of Carbon-Heteroatom Bond Formation"
- J. Clayden, University of Manchester, UK, on "Stereocontrol with Amides"
- Koskinen, Helsinki University of Technology, Finland, on "Internal Asymmetric Induction in Total Synthesis"
- M. Saunders, Yale University, Connecticut, USA, on "Atoms and Small Molecules Inside Fullerenes"
- L. Latos-Grazynski, Wroclaw University, Poland, on "Carbaporphyrinoids"
- M. A. Pericàs, Faculty of Qu miques, Barcelona, Spain, on "Strategies and Applications of Catalytic Ligands from Synthetic Epoxides"
- Ojima, State University of New York at Stony Brook, USA, on "Discovery and Development of New Generation Taxane Anticancer Agents"
- B. L. Feringa, University of Groningen, The Netherlands, on "Molecular Switches and Molecular Motors"
- L. F. Tietze, University of Göttingen, Germany, on "Multiple Pd-Catalysed Transformations for Natural Product Synthesis"
- R. Deschenaux, University of Neuchâtel, Switzerland, on "Liquid-Crystalline Fullerenes"
- G. Balme, Université Claude Bernard, Lyon, France, on "New Route to Heterocyclic Compounds *via* Palladium-Mediated Cascade and Multicomponent Reactions"

In addition, 23 invited lectures and 46 oral communications were presented in two parallel sessions. Four invited lectures were organized as "PLIVA Sessions" covering the topic "Current Trends in Drug Research and Development" (PLIVA is a Croatian pharmaceutical company and a sponsor for ESOC 13). There were 10 poster-flash contributions (5 minute oral presentation), given by young perspective scientists, and 256 posters presented.

The pleasant environment, the special ambience of the conference location, and the Mediterranean spirit of frequent and friendly communication contributed considerably to the great success of the 13th European Symposium on Organic Chemistry. ESOC 14 will be held in July 2005 in Helsinki, Finland; the chairman of the Organising Committee is Prof. K. Wahala <kristiina.wahala@helsinki.fi>.

Andreja Lesac <alesac@irb.hr>, member of the Local Organising Committee of ESOC 13, is research scientist at Rudjer Boskovic Institute.

Interfaces and Interphases in Multicomponent Materials

by Edina Epacher

Interfaces form spontaneously in all heterogeneous systems. Advanced composites, for example, cannot be made or applied without good adhesion and appropriate interphase properties. In the past the importance of interfaces and interphases brought to life two conferences on composites interfaces, the International Conference on Composite Interfaces (ICCI) and the Interfacial Phenomena in Composite Materials (IPCM). In the last few years, the scientific community interested in interphases made considerable effort to merge the two meetings. The conference on **Interfaces and Interphases in Multicomponent Materials** (IIMM) was the result, a new meeting that brought together all scientists working in the field. Meanwhile, the interest of the industry, as well as academia, partly shifted from advanced composites to other heterogeneous systems, like nanocomposites, biomaterials, or natural fiber reinforced composites. Therefore, the scope of the new, unified conference was changed to reflect these developments.

The 1st IIMM conference sponsored by IUPAC was held in Balatonfüred, Hungary, 5–8 October 2003. The chairman of the meeting was Béla Pukánszky, professor of the Budapest University of Technology and Economics. Altogether 109 delegates attended the conference, including 27 students. There were 48 lectures and 56 posters presented. The eight invited lectures reflected well the relatively broad scope of the meeting, as they covered traditional fields as well as completely new areas.

Béla Pukánszky officialy opens the conference.

Keynote lectures discussing traditional problems in a non-conventional way were presented by Prof. Frank Jones, the chairman of IPCM, who discussed stress transfer in single fiber composites, and by Prof. Roger Rothon, who discussed surface modification of particulate fillers for thermoplastic and thermoset composites as well as for rubbers. Prof. Ton Peijs gave an overview of the possibilities, present state, and future of green composites reinforced with natural, as well as polymer fibers. The interesting paper of Prof. Hatsuo Ishida, the founder of ICCI, involved intercalation mechanisms in layered silicates. Completely new fields as well as approaches were presented by Prof. T. Miyashita (preparation of nanolayers), Prof. H.-J. Butt (analysis of interfaces by AFM), and by Prof. R. Maegerle (nanotomography of interfaces and interphases) for the preparation and study of heterogeneous materials. These lectures corresponded with the intention of the organizers to broaden the scope of the meeting and bring new ideas to established areas. The organizers encouraged young scientists to present their results in oral presentations. In one presentation, Dr. Dania Olmos discussed her ideas on thermal relaxations at the interface of epoxy/silica composites.

Dr. Dania Olmos

The Plueddemann Award, traditionally presented at ICCI meetings for excellence in research on composite interfaces, was presented at the new IIMM conference for the first time. This year's award went to Béla Pukánszky, chairman of the meeting, for his achievements in interface science, but also for his role in the merger of the two meetings.

Lively discussions were conducted during the three hours of the poster session, which featured 56 posters, and covered the entire field of the meeting. Three prizes and two additional certificates were given for the best posters presented by young scientists. Winners were Attila Domján, Hans Miltner, Boril Chernev, Asa Barber, and Stephane Bizet.

An Interface Forum was also held during the meeting to decide on the future of the conference and related issues. The delegates unanimously voted to continue the series. The conference was conducted in a very professional manner, provided a friendly atmosphere, and included several social programs. Attendees left the meeting with a good feeling and strong intention to attend the next conference in the series, which is planned for September 2005, tentatively in Lyon or Hong Kong.

Dr. Edina Epacher <epacher@muatex.mua.bme.hu>, associate professor at the Budapest University of Technology and Economics, was the scientific secretary of the IIMM conference.

Molecular Characterization of Polymers: From Conventional Bulk Methods to Separation Procedures

by Dusan Berek

The **17th Bratislava International Conference on Macromolecules**, "Molecular Characterization of Polymers," was held 24–28 August 2003. The conference was jointly sponsored by the Macromolecular Division of IUPAC, the Federation of European Chemical Societies, the European Polymer Federation, the Slovak Chemical Society, and the Slovak Academy of Sciences' Polymer Institute.

The meeting attracted 71 participants from 27 countries. Overall, there were 38 oral presentations, complemented by over 40 posters, two open discussion sessions, and an IUPAC meeting on polymer round robin tests. Included were lectures of three generations of polymer scientists—from Ph.D. students who delivered their first talks at an international forum to Prof. H. Benoit (France), the "father" of the famous universal calibration for size exclusion chromatography.

Chromatographic methods and synthetic polymers dominated the conference program. Still, neutron scattering (J. Higgins, UK), mass spectrometric methods (L. Prokai, USA), temperature rising elution fractionation (TREF) and crystallization analysis fractionation (CRYSTAF) (S. de Goede, South Africa), ultracentrifugation (D. Hunkeler, Switzerland) and the monitoring of mechanical properties (M. Matsuo and S. Osaki, Japan) were discussed as well. Theoretical approaches to the solution of chromatographic problems were presented by G. J. Fleer (Netherlands), A. Skvortsov (Russia), T. Bleha and P. Cifra (Slovakia), M. Netopilik (Czech Republic), F. Dondi (Italy), and G. R. Meira (Argentina). Progress in the characterization of complex polymer systems, which exhibit more than one distribution in their molecular characteristics, was reviewed by P. Kratochvil (Czech Republic), P. Schoenmakers and A. van den Horst (Netherlands), A. Lederer (Germany), R. Tsiang (Taiwan), M. Strlic, and M. Zigon and E. Zagar (Slovenia). Innovative methods for separation and characterization of macromolecular substances were introduced by T. Chang (Korea), P. Jandera and S. Podzimek (Czech Republic), and R. Mendichi (Italy). Chromatographic instrumentation was discussed by D. Havlickova (Czech Republic), P. Kilz (Germany), and D. Heinzmann (UK). Studies of processes occurring part in the chromatographic columns were presented by C. Wandrey (Switzerland), S. Saunders and L. Creaser (UK), D. Berek (Slovakia), and T. Macko (Germany).

The scientific program was accompanied by a small exhibition of chromatographic equipment, materials, software and literature; representatives of three companies delivered the "Company Lectures."

Organized by Dusan Berek, the five-day event included a concert, as well as excursions to Devin castle at the confluence of the Danube and Moravia rivers, the Danube dam at Cunovo where participants could watch a water slalom competition, and to the Old Town of Bratislava.

For several young participants, especially for those from Central and East European countries, the conference provided their initial contact with the international scientific community. The 18th international conference in this series is planned for 2006.

Dusan Berek <upoldber@savba.sk> leads the Liquid Chromatography Department of the Polymer Institute and also serves as the president of the Slovak Chemical Society. He is an associate member of the IUPAC Macromolecular Division.

Medicinal Chemistry in Asia

by Tetsuo Nagano and Kazuya Kikuchi

The **AFMC International Medicinal Chemistry Symposium** (AIMECS) is a biannual international meeting of the Asian Federation for Medicinal Chemistry. The 5th AIMECS took place in Kyoto, Japan, 14–17 October 2003. Organized by the Asian Federation for Medicinal Chemistry (AFMC), the conference was managed by the Pharmaceutical Society of Japan's Division of Medicinal Chemistry, with the direction of an organizing committee, which compiled an up-to-date and attractive conference program. The event was co-sponsored by IUPAC and the Japanese Ministry of Health, Labour, and Welfare.

The term "medicinal chemistry," as used here, is very comprehensive, and includes the philosophy and technology related to drug discovery. Previous conferences were held in Tokyo, Japan (1995); Soeul, Korea (1997); Beijing, China (1999); and Brisbane, Australia (2001).

More than 650 participants from 24 nations attended the conference, which was held in th old capital of Japan during the beautiful autumn season. Through 6 plenary lectures, 37 invited lectures, and 243

poster presentations, attendees reported on and discussed the latest progress in sciences supporting drug discovery in. Highlighted lectures include the following:

Viruses and Killer T Cells, Peter C. Doherty, The University of Melbourne, Australia—Doherty's lecture was focused on the $CD8^+$ killer T cell, which is an essential component of the adaptive immune system. The $CD8^+$ T cell-mediated immunity targets to virus-producing cellular factors expressing virus-induced changes of self cell-surface gylcoproteins. Specific recognition operates via precisely configured T cell receptors that recognize non-self peptides bound in the tip of the class I MHC glycoproteins, which are very polymorphic. The $CD8^+$ killer T cell is a very effective molecular machine for finding and destroying abnormal cells. Doherty is trying to use the $CD8^+$ T cell mediated immune system proteins for preventative or therapeutic treatment.

Discovery and Development of Drugs on a Global Basis, Aoki Hatsuo, Fujisawa Pharmaceutical. Co., Ltd., Japan—Hatsuo discussed research and development activities at Fujisawa Pharmaceutical Co., Ltd. According to Hatsuo, the discovery and development of drugs requires far more time compared with other high-tech industrial products. Accordingly, the cost of drug development is quite high. To maximize the return on an investment, drug development requires well-organized and comprehensive management covering all the processes through discovery; pre-clinical and clinical developments; chemistry, manufacturing, and control; and even marketing planning. However, the speaker also emphasized that drug discovery and development processes are still highly dependent on the creativity and sometimes luck of the researchers involved.

The Chemistry of Drug Discovery: Short and Long Term Strategies, Robert W. Armstrong, Eli Lilly and Company, Indianapolis IN, USA—Armstrong focused on the short- and long-term approaches to small molecule drug discovery, utilizing practical technologies such as *in silico* evaluation and combinatorial chemistry. He discussed the use of chemogenetics in drug design and levels of target similarity, employing kinases as an example.

Mechanism of Intracellular Transport and Kinesin Superfamily Ptoreins (KIFs): Genes, Structure, Dynamics, Functions, and Diseases, Nobutaka Hirokawa, The University of Tokyo, Japan—Hirokawa talked about the mechanism of intracellular transports, focusing on kinesin superfamily proteins (KIFs), which were identified and characterized by his group. He showed many important functions of KIFs, such as neuronal survival, fundamental developmental events, and higher brain functions. In his research, Hirokawa actively used various technologies, including molecular cell biology, molecular genetics, biophysics, X-ray crystallography, and cryo-electron microscopy. He showed videos of some of these experiments.

Drug Delivery—What will be the Future?, Hans E. Junginger, Leiden University, Netherlands—As Junginger relayed in his lecture, most endogenous peptides are for the treatment of chronic diseases and are currently only administrated by repeated injection. The possibility to administer these drugs using alternative routes, especially the oral route, would strongly increase the safety of medication and additional patient compliance. In his lecture, the mucoadhesive delivery system (superporous hydrogel (SPH) and SPH composite (SPHC)), the chitosan derivative based delivery system, and the transdarmal delivery system (iontophoresis) were discussed. Novel delivery systems based on SPH and SPHC polymers were used to improve the intestinal absorption. Iontophoresis could enable direct control of the dose of drug for Parkinson's disease. This method can achieve optimal drug therapy (on-demand) with a minimum of toxic side effects.

Molecular Machines for Protein Degradation, Robert Huber, Max-Planck-Institut für Biochemie, Martinsried, Germany—The degradation of cytosolic protein is carried out predominantly by protease machines. Their proteolytic active sites are sequestered within the particles and located on the inner walls. The access of protein substrate is regulated by protease sub-complexes or protein domains. In his lecture, Huber described four protease machines (proteasome, HslV/HslU, tricorn and DegP) displaying different subunit structures.

The next AIMECS will be held in Korea in 2005.

Dr. Tetsuo Nagano <tlong@mol.f.u-tokyo.ac.jp>, program Chair of AIMECS 03, is a professor in the Graduate School of Pharmaceutical Sciences at the University of Tokyo. Dr. Kazuya Kikuchi <kkikuchi@mol.f.u-tokyo.ac.jp>, program co-chair of AIMECS 03, is an associate professor in the Graduate School of Pharmaceutical Sciences at the University of Tokyo.

DNA Supramolecular Assemblies

5–6 May 2004, Avignon, France

The **DNA Supramolecular Assemblies Workshop** will be held 5–6 May 2004 in Avignon, France. This workshop aims to explore fundamental science questions related to DNA supramolecular assemblies.

Innovation and application of supramolecular assemblies have reached impressive new heights. For example, organizations involving nucleic acids have been used for drugs or DNA delivery, and can also be efficient as sensors for detection purposes. It is a period of great promise in the area of self-assemblies and supramolecular systems involving DNA, RNA, or more generally, systems capable of information storage. If recent scientific progress is a fair indicator, the future promises remarkable new developments in molecular recognition elements with a vast array of applications. Thus, it is timely to bring together leading academic scientists to discuss the present and future of research.

Major topics at the meeting will include the synthesis and physico-chemical of DNA supramolecular assemblies, nucleic acid transport and gene delivery, and DNA sensors.

The participants will be introduced to colleagues in the field who may be able to aid in particular difficulties, spark new ideas, and refocus efforts. Long-term collaborations between scientists having mutual interests, yet complimentary capabilities, may be established. In short, there is great potential for research enhancements.

Participation and accommodations are limited, and it is recommended that registration and travel arrangements be finalized early.

See calendar on page 34 for contact information

www.lcb.univ-avignon.fr/workshop.htm

This workshop is supported by IUPAC as an innovative conference on *New Directions in Chemistry*—for more information on IUPAC sponsorship and financial support opportunities see <www.iupac.org/symposia>.

Biodegradable Polymers and Plastics

1–4 June 2004, Seoul, Korea

The **8th World Conference on Biodegradable Polymers and Plastics** (BDPP 8) will be held at Hanyang University in Seoul, Korea from 1–4 June 2004. Topics including environmentally degradable polymeric materials, degradable polymers from renewable resources, natural polymeric materials, and biomedical applications utilizing degradable polymers will be discussed.

The conference is a continuation of the series on biodegradable polymers, which began in 1989 in Toronto as the International Scientific Consensus Workshop on Degradable Materials. In 2002, the 7th World Conference on Biodegradable Polymers and Plastics held in Tirrenia, Italy, and attended by more than 250 participants manifested increasing interest from academia, industry, and administrations worldwide in biodegradable polymers and their sustainability. This conference is jointly organized by the Korean Biodegradable Plastics Association, the Biodegradable Plastics Society of Japan, the European Degradable Plastics Society, the BioEnvironmental Polymer Society, the Polymer Society of Korea, and Hanyang University.

Following in the tradition of the preceding meetings, BBDP 8 will provide a forum of exciting discussions for those working in the fields of biodegradable polymers. The technical program of the 8th Conference consists of invited lectures by world experts and contributed oral and poster presentations. The registration fee, including the abstract book, conference proceedings on CD-ROM, lunches and refreshments, and welcoming reception, is available at a reduced rate before 31 March. A discounted registration fee is available for students.

Seoul, the capital of the Republic of Korea, is one of the 10 largest cites in the world. A distinctive characteristic of Seoul is its remarkable blend of the past and present, made possible by an effort to preserve the best aspects of Korea's unique 5000-year culture. Tours are available for accompanying persons, and accommodation information is available on the conference Web site.

See calendar on page 34 for contact information

www.bdpp8.com

Emulsion Polymerization and Latex Technology

7–11 June 2004, Bethlehem, Pennsylvania, USA

The **35th Annual Emulsion Polymers Institute (EPI) One-Week Short Course: Advances in Emulsion Polymerization and Latex Technology** will be held at Lehigh University 7–11 June 2004. This course is designed for engineers, chemists, other scientists, and managers who are actively involved in emulsion work, and for those who wish to develop expertise in the area.

The course is an in-depth study of the synthesis and properties of high polymer latexes. The subject matter includes a balance of theory and applications as well as a balance between chemical and physical problems. Lectures, given by leading academic and industrial workers, begin with introductory material and review, and then progress through recent research results.

www.lehigh.edu/~esd0/luscbroc.htm

CHEMRAWN XV Chemistry for Water

21–23 June 2004, Paris, France

CHEMRAWN XV— Chemistry for Water will take place 21–23 June 2004 in Paris, France. The conference will explore the latest scientific and engineering approaches and the opportunities to contribute to resolve major issues with the perspective of a global strategy and a series of proposals and policy recommendations. Representatives of academia, industry, government, non-governmental organizations and media will meet to conduct an objective assessment of the technical state-of-the-art in the various areas concerned with fresh water availability, waste water treatments and with water depollution.

A major objective of Chemrawn is to define priorities from a chemical perspective, with the aim of providing leaders in governments, industries, universities and other concerned organizations with the information needed for effective action.

Presentations accepted by the International Scientific Committee will be included in the proceedings of Chemrawn XV.

The exhibition will offer an excellent opportunity for the societies and organizations to communicate on their products, processes and know-how. Those interested in receiving information should contact the Organizing Committee.

Chemrawn XV will take place in the prestigious site of the Maison de la Chimie, in Paris, close to the Invalides air terminal. The conference will be held in French and English with translation in both languages. Post-conference tours and accompanying person's programs will be arranged. Visits to several monuments, such as, Museum Louvre, Castel of Versailles, cruise on the river Seine, Montmartre, Eiffel Tower have been tentatively planned.

See calendar on page 34 for contact information

www.chemrawnxv.org

Coordination and Organometallic Chemistry

27 June–2 July 2004, Santa Fe, New Mexico, USA

The **11th International Conference on the Coordination and Organometallic Chemistry of Germanium, Tin, and Lead** will be held 27 June to 2 July 2004 in Santa Fe, New Mexico, USA. The latest in this series of triennial symposia will follow the established single-session format of plenary, invited, and contributed papers without overlapping/competing presentations. A single poster session is planned in which the posters are on view for the duration of the meeting, with specified times for authors to be present.

The topics to be covered range from multiple-bonded element-element chemistry to new pharmaceutical candidates to the interactions of lead in

biological systems. A special session concerning new environmental aspects of organotins, including high-volume production, will be presented by industrial participants. This will ensure a baseline set of health and environmental effects data is available to the regulatory community and the public.

An opening mixer will be held on 27 June and a banquet will be held in the evening of 1 July. Reduced-rate accommodations may be arranged at the Radisson Hotel, which offers a blend of northern New Mexico's distinct cultural influences. The hotel is located close to the historic plaza and internationally recognized Santa Fe Opera. Registration is available online.

See calendar on page 34 for contact information

www.gtl-xi.utep.edu

Carbohydrates

23–27 July 2004, Glasgow, Scotland, UK

The **2004 International Carbohydrate Symposium** (ICS) will be held at the Scottish Exhibition and Conference Centre (SECC) in Glasgow, Scotland, UK. Previous meetings in this series were held in Cairns, Australia (2002); Hamburg, Germany (2000); and San Diego, USA (1998).

Under the general theme "Carbohydrate Symposium," the event will comprise new and emerging trends in the field, with particular emphasis on synthetic methodology and applications in the design and synthesis of bioactive organic compounds. Relevant aspects of biological, natural products, and materials chemistry will also contribute to a program catering to a wide range of interests in contemporary carbohydrate chemistry, biochemistry, and medicine, and offering a visionary perspective on future challenges and opportunities.

The program will consist of a mix of plenary, keynote, shorter contributed lectures, and two formal poster sessions, which will be presented under the themes "Carbohydrate Chemistry and Enzymology," "Carbohydrates in Medicine and Biology," and "Carbohydrate Materials and Biopolymers."

The SECC is an excellent conference venue with easy access to Glasgow International Airport and two other international airports; there is also a fast rail link to London. The city of Glasgow, recently voted European City of Culture, has many attractions for art, history, and sport. All of the accommodations (student accommodations and a wide range of hotels), scientific programs, and social activities will be in walking distance of each other.

See calendar on page 35 for contact information

www.rsc.org/lap/confs/ICS22.htm

Organometallic Chemistry

25–30 July 2004, Vancouver, Canada

The **21st International Conference on Organometallic Chemistry** will be held on the campus of the University of British Columbia in Vancouver, Canada. All modern advances and trends in organometallic chemistry will be discussed.

A combination of plenary and invited lectures over three parallel sessions will form the basis of the meeting. Oral submissions and posters sessions will also be incorporated. The lectures will cover these broadly defined subjects:

- organometallic derivatives of the transition metals (including 4f/5f elements)
- organometallic derivatives of the main group elements
- metal-mediated organic synthesis and catalysis
- theoretical methods in organometallic chemistry
- physical methods in organometallic chemistry

The plenary lectures will be presented by Guy Bertrand (France/USA), Tamio Hayashi (Japan), Richard R. Schrock (USA), Douglas W. Stephan (Canada), and Gerard van Koten (Netherlands). In addition, 30 invited speakers have agreed to present their current work on a wide variety of topics. The deadline for submission of abstracts is 31 March 2004.

The University of British Columbia is situated on a forested peninsula with spectacular views of the ocean and mountains, yet is only 20 km (13 miles) from

Vancouver International Airport and 10 km (6 miles) from downtown Vancouver. Social events will include an opening reception on 25 July and a traditional First Nations salmon barbecue to be held in the spectacular setting of UBC's Museum of Anthropology on 29 July. More detailed information is available on the Web site.

See calendar on page 35 for contact information

www.conferences.ubc.ca/xxi_icomc

Chemical Thermodynamics

17–21 August 2004, Beijing, China

The **IUPAC International Conference on Chemical Thermodynamics** (ICCT) has been held biennially since 1969. It has become a pageant for scientists from around the world working in broad areas of chemical thermodynamics.

The 18th International Conference on Chemical Thermodynamics (2004) is organized by the Chinese Chemical Society and is jointly sponsored by IUPAC and a newly established organization, the International Association of Chemical Thermodynamics. The conference will be held in Beijing, China from 17–21 August 2004. It consists of a Rossini lecture, plenary lectures, invited lecturers, oral presentations, and poster sessions covering all the aspects of recent experimental, theoretical, simulation, and applied developments in chemical thermodynamics. A special focus will be on the interdisciplinary research fields.

Topics will include electrolyte and non-electrolyte solution thermodynamics; new materials (including polymers); phase equilibrium, supercritical fluids, and separation technologies; biological, medical, pharmaceutical, agricultural & food sciences; colloid and interface science; non-equilibrium thermodynamics, statistical thermodynamics, and molecular simulation; thermochemistry and molecular energetics; industrial thermodynamics and data bases; thermodynamic frontiers and education (workshop); ionic liquids (workshop); and new experimental techniques, including nanotechnology (workshop).

An exhibition of scientific instruments and equipment by leading manufacturers, and also of books and journals, will take place during the conference. Interested companies should contact the Secretariat of ICCT-2004.

The conference will be held at Fragrant Hill Hotel. It is a four-star hotel located in the famous scenic Fragrant Hill Park. For young scientists (postdocs and students) there is a more economical hotel: Fragrant Hill Villa.

All participants are requested to complete the registration form (available online) and mail it to the Secretariat by 30 April 2004. Reduced registration fees are available for a restricted number of participants from East European and developing countries.

See calendar on page 36 for contact information

www.ccs.ac.cn/ICCT2004.htm

Heteroatom Chemistry

20-25 August 2004, Shanghai, China

The **7th International Conference on Heteroatom Chemistry** (ICHAC-7), organized under the joint auspices of the Chinese Chemical Society and Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, will be held 20–25 August 2004 in Shanghai. The main objective of the conference is to generate channels for the interflow of innovative ideas among practicing chemists worldwide. ICHAC-7 will provide an international forum for presentation and discussion, by both professionals and students alike, of new findings in all aspects of heteroatom chemistry.

The scientific sessions will consider all modern advances in heteroatom chemistry and their relevance for present and future applications, including organocatalysis, heteroatom chemistry directed toward organic synthesis, mechanistic and structural aspects of heteroatom chemistry, and new heteroatom-containing materials.

Abstracts for poster and oral presentations will be accepted until 31 May, and early registration is available until 31 July. Bona fide student participants will be accorded a substantial reduction in the registration fees.

See calendar on page 36 for contact information

www.sioc.ac.cn/ICHAC-7/

Mark Your Calendar

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

2004

3–8 April 2004 • Macromolecules • Stellenbosch, South Africa
UNESCO Introductory Course (3–4 April) and 7th Annual UNESCO/IUPAC Conference on Macromolecules with Special Sessions on Polymers in Medicine, Nanotechnology and Degradation (5-8 April)
Prof. R. D. Sanderson, UNESCO Associated Centre for Macromolecules & Materials, Institute for Polymer Science, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa, Tel: +27(21) 808-3172, Fax: +27(21) 808-4967, E-mail: rds@sun.ac.za

5–6 May 2004 • DNA Supramolecular Assemblies • Avignon, France.
Workshop on DNA Supramolecular Assemblies
Dr. Philippe Barthélemy, Université d'Avignon et des Pays de Vaucluse, Faculté des Sciences, Département de Chimie, 33, rue Louis Pasteur, F-84000 Avignon, France, Tel.: +33 4 90 14 44 65, Fax: +33 4 90 14 44 41, E-mail: philippe.barthelemy@univ-avignon.fr

17–21 May 2004 • Mycotoxins and Phycotoxins • Bethesda, Maryland, USA
11th International Symposium on Mycotoxins and Phycotoxins (ISMP-11)
Dr. Douglas L. Park (HFS-345), CFSAN, 5100 Paint Branch Parkway, College Park, MD, 20740, USA, Tel: +1 301 436 2401, Fax: +1 301 436 2644, E-mail: dpark@cfsan.fda.gov

23–26 May 2004 • Bio-interfaces • Barossa Valley, South Australia, Australia
The Ian Wark Research Institute International Conference & Workshop on Physical Chemistry of Bio-Interfaces
Prof. Hans Griesser, Ian Wark Research Institute, University of South Australia, Mawson Lakes Campus, Mawson Lakes, South Australia, Australia 5095, Tel.: +61 8 8302 3703, Fax: +61 8 8302 3683, E-mail: hans.griesser@unisa.edu.au

1–4 June 2004 • Biodegradable Polymers and Plastics • Seoul, Korea
8th World Conference on Biodegradable Polymers and Plastics
Prof. S. S. Im, Department of Polymer and Textile Engineering, Hanyang University, 17 Haengdang-dong, Seongdong-gu, Seoul 133-791, Korea, Tel.: +82-2-2290-0495, Fax: +82-2-2297-5859, E-mail: imss007@hanyang.ac.kr

14–18 June 2004 • π-Electron Systems • Ithaca, New York, USA
6th International Symposium on Functional π-Electron Systems
Prof. George Malliaras, Materials Science and Engineering, 327 Bard Hall, Cornell University, Ithaca, NY, 14853-1501, USA, Tel.: +1 607 255-1956, Fax: +1 607 255-2365, E-mail: george@ccmr.cornell.edu

21–23 June 2004 • Chemistry for Water • Paris, France
CHEMRAWN XV—Chemistry for Water
Chemrawn XV Organising Committee, 11, rue de Vanves, 92100 Boulogne, France, Tel.: +33 1 41 41 00 66, Fax: +33 1 41 41 09 68, E-mail: chemrawnXV@m2c.fr

27 June–1 July 2004 • Biomolecular Chemistry • Sheffield, United Kingdom
7th International Symposium on Biomolecular Chemistry (ISBOC-7)
Prof. George M. Blackburn, University of Sheffield, Department of Chemistry, Sheffield, S3 7HF, UK, Tel.: +44 114 222 9462, Fax: +[44] 114 273 8673, E-mail: g.m.blackburn@sheffield.ac.uk

27 June–2 July 2004 • Germanium, Tin, and Lead • Santa Fe, New Mexico, USA
XIth International Conference on the Coordination and Organometallic Chemistry of Germanium, Tin, and Lead
Prof. Keith Pannell, Department of Chemistry, University of Texas at El Paso, El Paso, TX, 79968-0513, USA Tel.: +1 915-747-5796, Fax: +1 915-747-5748, E-mail: kpannell@utep.edu

4–9 July 2004 • Phosphorus Chemistry • Birmingham, United Kingdom
16th International Conference on Phosphorus Chemistry (ICPC 16)
Prof. Pascal Metivier, Rhodia, R&D for Phosphorous and Performance Derivatives, Oak House, reeds Crescent, Watford, WD24 4QP, UK, Tel.: +44 1923 485609, E-mail: pascal.metivier@eu.rhodia.com

4–9 July 2004 • Macromolecules • Paris, France
40th International Symposium on Macromolecules—IUPAC World Polymer Congress (MACRO 2004)
Prof. Jean-Pierre Vairon, Université Pierre et Marie Curie, Laboratoire de Chimie des Polymères, Case 185, 4 Place Jussieu, F-75252 Paris Cédex 05, France, Tel: +33 1 44 27 50 45, Fax: +33 1 44 27 70 89, E-mail: macro04@ccr.jussieu.fr

11–15 July 2004 • Polymer Biomaterials • Prague, Czech Republic
43rd PMM Microsymposium: Polymer Biomaterials: Biomimetic and Bioanalogous Systems
Drahomir Vyprachticky, Institute of Macromolecular Chemistry, Heyrovskeho nam. 2, CZ-162 06 Praha 6, Czech Republic, Tel.: +420 296 809 332, Fax: +420 296 809 410, E-mail: sympo@imc.cas.cz

17–22 July 2004 • Photochemistry • Granada, Spain
20th IUPAC Symposium on Photochemistry
Prof. Dr. Miguel A. Miranda, Departamento de Química/Instituto de Tecnologia Química UPV-CSIC, Universidad Politecnica de Valencia, Avenida de los Naranjos, s/n, E-46022 Valencia, Spain, Tel: + 34 963877807, Fax: + 34 963877809, E-mail: mmiranda@qim.upv.es

18–21 July 2004 • Chemical Sciences in Changing Times • Belgrade, Serbia and Montenegro
4th International Conference of the Chemical Societies of the South-Eastern European Countries
Prof. Ivanka Popovic, Belgrade University, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Belgrade, Serbia and Montenegro, Tel.: +381 11 337 0478, Fax: +381 11 337 0473, E-mail: icosecs@elab.tmf.bg.ac.yu

18–23 July 2004 • Coordination Chemistry • Merida, Yucatan, Mexico
36th International Conference on Coordination Chemistry
Prof. Norah Barba-Behrens, Dept. de Química Inorgánica, Universidad Nacional Autónoma de México, Ciudad Universitaria, Coyoacán, México, D. F., 04510, México, Tel./Fax: +52(55)5622-3810, E-mail: norah@servidor.unam.mx

18–23 July 2004 • Polymers and Organic Chemistry • Prague, Czech Republic
11th International Conference on Polymers and Organic Chemistry 2004 (POC '04)
Dr. Karel Jerabek, Institute of Chemical Process Fundamentals, Rozvojova 135, 165 02 Prague 6, Czech Republic, Tel.: +420 220 390 332, Fax: + 420 220 920 661, E-mail: kjer@icpf.cas.cz

23–27 July 2004 • Carbohydrates • Glasgow, United Kingdom
22nd International Carbohydrate Symposium
Prof. E. Hounsell, School of Biological and Chemical Sciences, Birkbeck University of London, Malet St., London WC1E7HX, UK, Tel.: + 44 207 631 6238, E-mail: e.hounsell@bbk.ac.uk

25–29 July 2004 • Solubility Phenomena • Aveiro, Portugal
11th International Symposium on Solubility Phenomena, Including Related Equilibrium Processes (11th ISSP)
Prof. Clara Magalhaes, Department of Chemistry, University of Aveiro, P-3810-193 Aveiro, Portugal, Tel.: +351 234 401518, Fax: +351 234 370084, E-mail: issp@dq.ua.pt

25–30 July 2004 • Organometallic Chemistry • Vancouver, Canada
21st International Conference on Organometallic Chemistry (ICOMC)
21st ICOMC Secretariat, Conferences & Accomodation at UBC, 5961 Student Union Boulevard, Vancouver, BC, Canada V6T 2C9, Tel.: +1 604 822-1050, Fax: +1 604 822-1069, E-mail: registration@housing.ubc.ca

1–6 August 2004 • Organic Synthesis • Nagoya, Japan
15th International Conference on Organic Synthesis (ICOS-15) *(see poster on inside back cover)*
Prof. Minoru Isobe, ICOS15 Secretariat, c/o International Communications Specialists, Inc., Sabo Kaikan-bekkan, 2-7-4 Hirakawa-cho, Chiyoda-ku, Tokyo 102-8646 Japan, Tel: +81-3-3263-6474, Fax: +81-3-3263-7537, E-mail: icos@ics-inc.co.jp

2–7 August 2004 • Chemistry in Africa • Arusha, Tanzania
9th International Chemistry Conference in Africa—Chemistry Towards Disease and Poverty Eradication
Dr. G. S. Mhinzi, University of Dar es Salaam, Chemistry Department, PO Box 35061, Dar es Salaam, Tanzania, Tel./Fax: +255 22 2410038, E-mail: mhinzi@chem.udsm.ac.tz

3–8 August 2004 • Chemical Education • Istanbul, Turkey
18th International Conference on Chemical Education (18th ICCE)
Prof. Dr. Mustafa L. Berkem, Chairman, Marmara University, Ataturk Faculty of Education, TR- 81040 Goztepe-Istanbul, Turkey, Tel: +90 2163459090/231, Fax: +90 2163388060, E-mail: icce2004@marmara.edu.tr

15–19 August 2004 • Polymers • Bethesda, Maryland, USA
Polymer Networks 2004
Dr. F. Horkay, Section on Tissue Biophysics and Biomimetics, National Institutes of Health, Bldg. 13, Room 3W16E, 13 South Drive, Bethesda, MD 20892, USA, Tel: +1 301 435 7229, Fax: +1 301 435 5035, E-mail: horkay@helix.nih.gov

Mark Your Calendar

15–20 August 2004 • Physical Organic Chemistry • Shanghai, China
17th IUPAC Conference on Physical Organic Chemistry (ICPOC-17)
Prof. Guo-Zhen Ji, Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, 354 Fenglin Road, Shanghai 200032, China, Tel: +86 21-64163300, Fax: +86 21-64166128, E-mail: jigz@pub.sioc.ac.cn

17–21 August 2004 • Chemical Thermodynamics • Beijing, China
18th IUPAC Conference on Chemical Thermodynamics
Prof. Haike Yan, Chairman, 18th ICCT c/o Chinese Chemical Society, PO Box 2709, Beijing, 100080, China, Tel.: +86 10 62568157, 86 10 62564020, Fax: +86 10 62568157, E-mail: qiuxb@infoc3.icas.ac.cn

20–25 August 2004 • Heteroatom Chemistry • Shanghai, China
7th International Conference on Heteroatom Chemistry (ICHAC-7)
Prof. Lin-xin Dai, ICHAC-7, c/o Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, 354 Fenglin Road, Shanghai 200032, China, Tel: +86-21-64163300- 3405, Fax: +86-21-64166128, E-mail: ICHAC@pub.sioc.ac.cn

22–28 August 2004 • Biological Polyesters • Beijing, China
International Symposium on Biological Polyesters (ISBP 2004)
Prof. George Guo-Qiang Chen, Department of Biological Sciences & Biotechnology, Tsinghua University, 100084 Beijing, China, Tel.: +86-10-62794217, Fax: +86-10-62794217, E-mail: chengq@mail.tsinghua.edu.cn

3–5 September 2004 • Chemistry of Vanadium • Szeged, Hungary
4th International Symposium on Chemistry and Biological Chemistry of Vanadium
Prof. Tamas Kiss, University of Szeged, Department of Inorganic and Analytical Chemistry, PO Box 440, H-6701 Szeged, Hungary, Tel.: +36 62 544337, Fax: +36 62 420505, E-mail: tkiss@chem.u-szeged.hu

5–10 September 2004 • Analytical Chemistry • Salamanca, Spain
European Conference on Analytical Chemistry—Euroanalysis XIII
Prof. J. Hernández Méndez, Departamento de Química Analítica Nutrición y Bromatología, Universidad de Salamanca, E-37008 Salamanca, Spain, Tel./Fax: +34-923-294483, E-mail: jhm@usal.es

12–15 September 2004 • Heterocyclic Chemistry • Sopron, Hungary
XXI European Colloquium on Heterocyclic Chemistry
Prof. György Hajos, Chemical Research Center, Institute of Chemistry, H-1025 Budapest Pusztaszeri ut, Hungary, Tel.: +36 1 3257550, Fax: +36 1 3257863, E-mail: ghajos@chemres.hu

20–23 September 2004 • Soil Science • Wuhan, China
Environmental Significance of Mineral-Organic Component-Microorganism Interactions in Terrestrial Systems
Dr. P. M. Huang, Department of Soil Science, University of Saskatchewan, 51 Campus Drive, Saskatoon SK S7N 5A8 Canada, Tel.: +306 966-6838, Fax: +306 966-6881, E-mail: huangp@sask.usask.ca

7–8 October 2004 • Trace Elements in Food • Brussels, Belgium
2nd International Symposium on Trace Elements in Food (TEF 2)
Dr. Michael Bickel, European Commission—Joint Research Centre, Institute for Reference Materials and Measurements, B-2440 Geel, Belgium, Tel.: +32 14 57 17 34, Fax: +32 14 57 17 87, E-mail: michael.bickel@cec.eu.int

17–22 October 2004 • Biotechnology • Santiago, Chile
12th International Biotechnology Symposium
Prof. Juan A. Asenjo, Centre for Biochemical Engineering and Biotechnology, University of Chile, Beauchef 861, Santiago, Chile, Tel.: +56 2 6784288, Fax: +56 2 6991084, E-mail: IBS2004@conicyt.cl

7–11 December 2004 • Agriculture • Jesenik, Czech Republic
Chemistry for Agriculture
Dr. Adam Pawelczyk, Wroclaw University of Technology, Smoluchowskiego 25, 50-370 Wroclaw, Poland, Tel.: +48 (0) 71-3202930, Fax: +48 (0) 71-3203469, E-mail: adam.pawelczyk@pwr.wroc.pl

2005

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

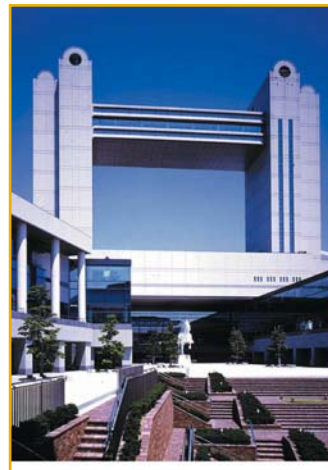
Mark Your Calendar

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

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

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



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Conference Schedule:
Since the programs are tentative and will be subjected to change, be sure to check our website often.

–	Morning	Afternoon	Evening
August 1 (Sun)	–	Registration	Welcome Mixer
August 2 (Mon)	Plenary Lectures	Invited Papers	–
August 3 (Tue)	Award Lectures	Poster Introduction & Poster Presentation	–
August 4 (Wed)	Award Lectures	Excursion	–
August 5 (Thu)	Plenary Lectures	Poster Introduction & Poster Presentation	Conference Banquet
August 6 (Fri)	Plenary Lectures	Plenary Lectures	–
August 7 (Sat)	Post - Conference Tours		

Plenary and Invited Speakers:
The most featured aspect of the ICOS-15 program is its numerous high-quality lectures by invited speakers. We plan to stage more of noted scientists as invited speakers.
Jan-E. Bäckvall (Stockholm University, Sweden), **Albrecht Berkessel** (Cologne University, Germany), **Erick M. Carreira** (ETH, Switzerland), **Marta Catellani** (Università di Parma, Italy), **André B. Charette** (University of Montreal, Canada), **Pauline Chiu** (The University of Hong Kong, Hong Kong), **Janine Cossy** (ESPCI, France), **Peter Dervan** (California Institute of Technology, USA), **Kuiling Ding** (Chinese Academy of Sciences, China), **Makoto Fujita** (The University of Tokyo, Japan), **Alois Fürstner** (Max-Planck-Institute, Germany), **Erick N. Jacobsen** (Harverd University, USA), **Eusebio Juaristi** (CINVESTAV-IPN, Mexico), **Sung Ho Kang** (Korea Advanced Institute of Science and Technology, Korea), **Sergey A. Kozmin** (University of Chicago, USA), **Yves Langlois** (University of Parisud, France), **Steven Ley** (Cambridge University, UK), **Deng Li** (Brandeis University, USA), **Chun-Chen Liao** (National Tsing Hua University, Taiwan), **Teck-Peng Loh** (National University of Singapore, Singapore), **Tien-Yau Luh** (Academia Sinica, Taiwan), **Stephen F. Martin** (The University of Texas at Austin, USA), **Keiji Maruoka** (Kyoto University, Japan), **Vijay Nair** (CSIR, India), **Ryoji Noyori** (Nagoya University), **Hermen S. Overkleeft** (Leiden Institute of Chemistry, The Netherlands), **Larry E. Overman** (University of California at Irvine, USA), **Ronaldo A. Pilli** (Universidade Estadual de Campinas, Brasil), **Dalibor Sames** (Columbia University, USA), **J. Fraser Stoddart** (University of California at Los Angeles, USA), **John L. Wood** (Yale University, USA), **Dan Yang** (The University of Hong Kong, Hong Kong)

Call for Papers:
We call for papers for symposia and poster sessions on the following topics: 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, Medicinal Drugs, and Agrochemicals Please submit the abstract of your presentation on-line at the conference website by no later than March 25, 2004.
URL http://www.ics-inc.co.jp/icos15/

Registration:

Category	Early Registration on or before May 31, 2004	Late & On-site Registration after June 1, 2004
Delegates	¥ 50,000-	¥ 55,000-
Students	¥ 25,000-	
Accompanying Persons	¥ 20,000-	
Conference Banquet on August 5 (Thu)	¥ 10,000-	

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