

---

## President's Report on the State of the Union

This address was presented by IUPAC President Professor Joshua Jortner at the 40<sup>th</sup> IUPAC Council Meeting on 13 August 1999 in Berlin, Germany.

### IUPAC and Worldwide Aspects of the Chemical Sciences

The International Union of Pure and Applied Chemistry serves as a scientific, international, nongovernmental, objective body in addressing global issues involving the chemical sciences. In recognition of the role of chemistry as a central science in a wide range of fields, the term "chemical sciences" is used here to refer to chemistry, broadly defined, and to those disciplines and technologies that make extensive and significant use of chemistry.

The future mission and function of IUPAC should rest on the response to the following current major trends in the chemical sciences:

- **Globalization of the Scientific-Technological Endeavor**

One of the hallmarks of our era is the rapid economic, technological, and communication expansion on the international level, which has an outstanding impact on the enhancement and expansion of international scientific and industrial activity in the chemical sciences.

- **Changes in the Chemical Sciences and Technology**

The science–technology chemistry world is undergoing a metamorphosis, reflecting the dominance of interdisciplinary unification, with the borders between the traditional research areas in chemistry being eroded and the merging of basic research and industrial applications.

- **Fast Expansion of the Chemical Sciences beyond Their Traditional Borders**

Modern chemistry spans the realm of materials science, environmental science, geological sciences, and biomolecular science, wherever molecular information is central and essential. The impact of modern chemistry on the broad fields of materials, health, and environment is seminal.

- **Mission-Oriented Service of Chemistry**

It is a major responsibility of the world chemistry community to contribute to the service of chemistry to international society in the areas of health, envi-



ronment, and education, and to global issues of capacity building in the developing world.

With the major changes, which have occurred worldwide in chemistry and chemical industry during the last decade, IUPAC has examined its role, structure, and function as the organization principally responsible for the global promotion of the chemical sciences. IUPAC must redefine its mission and define goals, strategies, and an operational mode to guide its approach and future contributions to the shaping of the chemical sciences in a rapidly changing world.

The two years since our last General Assembly have been active ones for IUPAC. In the realm of our Science Policy, the major events were the adoption of the Strategic Plan; the approval by the Bureau in September 1998 of the reorganization of the management of IUPAC's scientific work, changing the Union's scientific structure from one based on permanent commissions to one based on projects; the changes in the responsibilities of the Division Presidents and Division Committees; the establishment of three interdisciplinary interdivisional committees; and the establishment and implementation of project approval and evaluation processes.

Concurrently, the Union's scientific–industrial activities, which should and will rest on the principles of quality, relevance, and international dimensions, were perpetuated. These activities involve implementation of the Union's new policy in the organization of the world-class IUPAC Congress in Berlin next week and the initiation of the new program on Conferences on New Directions in Chemistry, with the organization of the first Workshop on Advanced Materials, together with the sponsoring of 45 symposia and conferences in 1998–1999.

The Union's regular activities in contributing to the

language and scientific-industrial framework of chemistry continued with the publication of 22 recommendations and reports in our official journal, *Pure and Applied Chemistry*, publication of nine books, and the important publication of a special issue of *Pure and Applied Chemistry* on the topic of environmental oestrogens, one of considerable industrial impact.

In the context of activities with international societal impact, the Union continued the CHEMRAWN Conferences program. IUPAC held a joint, most fruitful, meeting with the African Association for Pure and Applied Chemistry on Chemistry in the Development of Africa. In dissemination of information, the publication of six issues annually of the Union's bimonthly news magazine, *Chemistry International*, highlighted current activities and general policy issues.

The IUPAC web site was greatly expanded. The web site not only contains all the material in the *IUPAC Handbook*, but also a list and description of the current projects being worked on by IUPAC Commissions and Committees, current contact information for members of IUPAC bodies, a complete list of IUPAC publications, title pages of recent issues of *Pure and Applied Chemistry*, and the complete text of recent issues of *Chemistry International*. The web site already contributes toward the establishment of the electronic communications highway in less developed countries in Africa. The IUPAC web site has generated e-mail messages from many parts of the world, including Africa.

### Mission Statement and the Strategic Plan

I believe that one of the most important accomplishments of the Union during the last two years is the formulation and adoption of a mission statement and a strategic plan. Although we have long had objectives specified in our statutes, we now state succinctly:

IUPAC's mission is to advance the worldwide aspects of the chemical sciences and to contribute to the application of chemistry in the service of Mankind. In so doing, IUPAC promotes the norms, values, standards, and ethics of science and advocates the free exchange of scientific information and unimpeded access of scientists to participation in activities related to the chemical sciences.

Here we deliberately use the term *chemical sciences* to recognize chemistry as the central science and to express the Union's interest and involvement in chemistry as it is employed in the biological, environmental, geological, and materials sciences. We recognize explicitly that chemistry in its broadest sense is of fundamental importance to world development and that IUPAC has a responsibility to see that the fruits borne of chemistry are used to serve the world of which we

are a part. Our mission statement goes on to make it clear that IUPAC continues to promote the universality of science, as expressed by the International Council for Science (ICSU). To further its mission, IUPAC has established a set of ten long-range goals:

1. IUPAC will serve as a scientific, international, non-governmental body in objectively addressing global issues involving the chemical sciences. Where appropriate, IUPAC will represent the interests of chemistry in governmental and nongovernmental forums.
2. IUPAC will contribute to the advancement of research in the chemical sciences throughout the world.
3. IUPAC will assist chemistry-related industry in its contributions to sustainable development, wealth creation, and improvement in the quality of life.
4. IUPAC will facilitate the development of effective channels of communication in the international chemistry community.
5. IUPAC will promote the service of chemistry to society in both developed and developing countries.
6. IUPAC will utilize its global perspective to contribute toward the enhancement of education in chemistry and to advance the public understanding of chemistry and the scientific method.
7. IUPAC will make special efforts to encourage the career development of young chemists.
8. IUPAC will broaden the geographical base of the Union and ensure that its human capital is drawn from all segments of the world chemistry community.
9. IUPAC will encourage worldwide dissemination of information about the activities of the Union.
10. IUPAC will assure sound management of its resources to provide maximum value for the funds invested in the Union.

These long-range goals reflect on the inwardly directed goals of the service of IUPAC to the global world chemistry community, on the outwardly directed mission-oriented goals, on the broadening of the geographical base, and on the scientific-public principles of IUPAC's management.

The importance of the Strategic Plan is not only in precisely what it espouses but in its very existence. Never before has IUPAC (and perhaps not any of the international scientific unions) articulated a set of goals and strategic thrusts that provide an overall direction to the Union's activities. The goals are quite broad and are very ambitious—as indeed they should be. They provide targets toward which the Union should strive.

For the current biennium, we have a set of strategies by which we hope that the Union can move toward achieving its goals. These strategies are intended to

guide the development of operational plans and setting of priorities for optimal use of the Union's resources, both human and financial. In our agenda book, you see an interim report on the way in which all IUPAC bodies are addressing these strategies in the context of their own programs. These strategies will be modified, refined, and replaced as needed for the next biennium as a result of ideas brought forth by the Council, our National Adhering Organizations, many IUPAC bodies, and individual chemists concerned about the future of the Union.

### **Interdisciplinary Activities and Horizontal Programs**

The response of IUPAC to important developments in modern chemical sciences requires promotion of interdisciplinary activities and closing of gaps in the scientific activities of the Union, particularly in the areas of materials sciences and of biological chemistry. Three interdisciplinary, interdivisional programs were established in the areas of biomolecular chemistry, materials, and environmental chemistry. For each of these horizontal programs, one or two Divisions assume the primary responsibility for planning and execution of projects.

The Division of Organic Chemistry (III) has taken the lead in organizing work on biomolecular chemistry. The first product of this interdisciplinary effort is a microsymposium at the IUPAC Congress: "Novel Porphyrinoids and Their Metal Complexes". The lectures cover a broad range of subjects, from synthesis to biomimetic models to new materials to biomedical applications.

The Macromolecular Division and the Inorganic Chemistry Division have commenced a Strategic Initiative in Materials, to coordinate new and existing projects on materials science that require expertise from more than one IUPAC Division, and to act as a worldwide point of reference for issues related to materials science and IUPAC. An extensive outreach program has been undertaken, with an appeal for comments on what topics should be included in a future program of work in this area being published in a large number of national chemical magazines as well as in *Chemistry International* and on the IUPAC web site.

The Division of Chemistry and the Environment has taken the lead in coordinating the environmentally related activities of IUPAC. One example of this coordination effort is the organization of two special satellite meetings of the Congress jointly with the Gesellschaft Deutscher Chemiker: "Contributions of Chemistry to Ameliorating Environmental Contamination" and "Contributions of Chemistry to Sustainable Food Production". These seminars will be held on Wednesday afternoon and Thursday morning, 11–12 August, at the Freie Universität of Berlin.



**Prof. Joshua Jortner**

### **Changes in Organization and Management of IUPAC's Scientific Work**

The present structure of the Union precludes the fulfillment of many of its central scientific functions, as reflected in organizational fragmentation and resulting hindrance in the inception and conduct of horizontal interdisciplinary projects. The founders of IUPAC envisioned, and made provision for, the organization and action of a dynamic Union. In time, the concept of a changing structure was replaced by the current system of long-term Commissions, with little opportunity for Divisions to plan for scientific renewal and growth.

As early as 1953, IUPAC President Tiselius, in his State of the Union address, recommended setting up new Commissions on a trial basis and added: "Furthermore, it often seems better to establish a Commission for a limited time to study a definite problem than to appoint a great number of more or less permanent Commissions." In 1953, the UK delegation also made a more specific proposal—that, with rare exceptions, Commissions be appointed for a lifetime not exceeding four years. In spite of these proposals, 20 years later, in 1973, President Bénard felt it necessary to emphasize in his address to Council the need for IUPAC to adapt to evolution and growth. He said, "Everyone knows that in an organization like ours, it is easy to obtain general approval for the creation of new bodies, but that it is difficult to decide to abandon existing ones." He went on to warn that "An institution that does not have the strength to renew itself is an institution condemned at length to sterility."

Certainly in the ensuing 25 years, the Union has made many substantial alterations in adapting to the

changing needs of world chemistry, but the static nature of our scientific organization has largely persisted. Two years ago, as you heard in Geneva, the ad hoc Strategy Development and Implementation Committee (SDIC) had just begun its work. The SDIC issued its final report in April 1998. Parenthetically, I should add, in response to a concern expressed at Geneva, that the SDIC was then thanked for its work and dissolved, thus not adding another permanent body to our structure. The SDIC recommendations were endorsed by the Executive Committee, were widely circulated within IUPAC, and were discussed extensively.

With additional aspects that were developed by the Committee on Project Evaluation Criteria under the chairmanship of Professor Gus Somsen, and with significant changes made as a result of input from Division Presidents and others, an integrated program was presented to the Bureau a year ago. I was delighted that the Bureau, in its meeting in September 1998, approved a policy and an operational program based on the conceptual framework that the Union represents and serves the entire world chemistry community. The objective is to improve quality, relevance, international impact, and effectiveness of the Union's scientific work. The integrated program constitutes a holistic plan, which rests on major changes in the responsibilities of the Division Presidents and Division Committees, in the election procedures on the Division level, in project evaluation, and in the future function of Commissions.

The overwhelming final approval by the Bureau—a vote of 20–0 with two abstentions—reflects the broad consensus eventually achieved for approving the new program. Some aspects of the program, dealing with strengthening of Division Committees and the inception of a project-based system, began immediately.

The features of the integrated program approved by the Bureau are designed to give clear direction for the Union to:

- revitalize its scientific activities;
- ensure the selection of only high-quality projects to bear the IUPAC label;
- encourage participation by the worldwide chemistry community;
- optimize the use of IUPAC's limited financial resources; and
- simplify management and accountability.

One of the major objectives of the new program is to solicit ideas for IUPAC projects from the worldwide chemistry community and to set up short-term Task Groups to carry out the projects, with membership open to the entire community. A consequence of the project-driven system based on short-term Task Groups is that we will reduce our reliance on the long-term, essentially permanent Commissions that have assumed a

central role in IUPAC's scientific activities. Although the 37 current Commissions have eminent scientists as members and have collectively carried out excellent work over many years, their continuation year after year now has become an impediment to the development of new approaches within our Divisions. Moreover, we are now devoting most of our financial resources to support of these bodies and providing for their regular meetings, irrespective of the need for meetings or the requirements of their projects.

For many years, the biennial continuation of virtually all Commissions has become a routine exercise for the Council. Proposals from time to time for consolidation or termination of a few commissions have been virtually impossible to implement, because they appear to single out certain groups unfairly. The problem is not that we have some "bad" Commissions; the problem is the system itself. *The Bureau has recommended that Council, in exercising its responsibility under By-law 4.302, decide at the General Assembly in 1999 not to continue any present Commission beyond the end of 2001.* This step is a crucial one in the implementation of the integrated program that has been approved by the Bureau, and I believe that this step must be taken. It will permit the Divisions to take a fresh look at their programs and to develop strategies and mechanisms to meet future challenges.

The details of this program and its current status will be discussed later in connection with agenda items 16–18. Most parts are well underway. The Division Committees have been given greatly increased responsibility, and they have responded in a very positive manner, as you will hear in some of the Division Presidents' reports to you this morning. A system has been set up at the Secretariat to receive proposals for new projects, which are now subject to outside refereeing and rigorous evaluation. A Project Committee has been set up within the Bureau to handle the review and funding of larger projects and those that are interdisciplinary. I would like to thank our former Secretary General, Professor Gerrit den Boef, for agreeing to chair this important body. Also, an Evaluation Committee, under the chairmanship of Professor Gerhard Schneider, an Elected Member of the Bureau, to whom I am grateful, has been formed to provide retrospective evaluation of each project and thus to provide an objective assessment of our long-range accomplishments.

As we shall discuss later, Council is being asked to take important additional steps to enable the new program to operate effectively. By deciding not to extend the current Commissions beyond the end of 2001, Council can facilitate the Divisions' ability to develop strategies for carrying out their programs and permit each Division to allocate its financial resources between support of continuing bodies and support of scientific projects.

## Scientific Core Activities

The scientific core activities of the Union should rest on the principles of quality, relevance, merging of science and technology, international dimension, impact on broad fields, openness, communication, and mission-oriented service. These policy principles are reflected in the recent organization of some core activities.

The biennial 37<sup>th</sup> IUPAC Congress, to be held from 14–19 August 1999, will be the first Congress to be guided fully by the policy decision approved by the 65<sup>th</sup> Bureau in 1994, based on the report of Prof. G. Modena and myself. IUPAC acted to make the Congress a central scientific international event by fulfilling the following goals: to present the most outstanding relevant developments in modern chemistry; to inspire high standards of excellence in pure and applied chemistry research; to attract outstanding scientists to present central lectures on modern chemical research; and to inspire the young generation of chemists in developed and developing countries.

The theme of the 37<sup>th</sup> Congress, The Molecular Basis of the Life Sciences, has been realized in a program that demonstrates the vitality of the chemical sciences. The “frontiers of chemistry” refer both to the unexplored areas where pioneers search for new knowledge, but also to the boundaries between traditional disciplines where pioneers meet to create new knowledge by their interaction. Both these uses of the word frontiers describe this Congress. The work that will be presented is from pioneers investigating new aspects of the chemical sciences and is also the result of the fruitful collaboration of chemists with cell biologists, neuroscientists, immunologists, geneticists, and others from the ever-expanding boundaries of chemistry.

Future development of the chemical sciences lies largely in the hands of the younger generation of scientists. It is a central goal of IUPAC to contribute to the development of human capital in academic and industrial chemistry. Participation in major scientific events such as the IUPAC Congress is imperative for young scientists to become familiar with the developments at the frontiers of chemistry. I am proud of the program jointly sponsored by the Gesellschaft Deutscher Chemiker (GDCh), UNESCO, and IUPAC to bring 25 young scientists from developing countries to the Congress. These young scientists will participate by presenting posters in addition to attending the Congress events. This program is part of IUPAC's contribution to building capacity and strengthening the human capital of developing countries. On behalf of the entire world chemistry community and myself, it is a privilege to extend deep thanks and appreciation to the GDCh, its Board of Directors, President, Director General, and enthusiastic staff for the superb organization of the

Congress, and to the International Advisory Board and its Chairman, Professor Dr. R. Huber, for shaping the outstanding scientific program.

The 38<sup>th</sup> IUPAC Congress will be held in Brisbane, Australia in 2001. The International Advisory Board (IAB) has been appointed and has started, together with the National Committee, to shape the scientific program. I am indebted to the Chairman of the IAB, Professor Y. T. Lee, for this important contribution.

New research fields, where the activity is truly international, are expected to contribute to high-quality, significant scientific developments and to constitute the cutting edge for new technologies. The identification of such new research fields is of considerable significance for the international research community, for chemical industry, and for national and regional bodies interested in the enhancement of international collaboration of their members. IUPAC became involved in the identification, characterization, and recommendation of novel research directions by the organization of Conferences, with the involvement of the scientific leadership, on New Directions in Chemistry. The first “Workshop on Advanced Materials: Nanostructured Systems” took place in July 1999 in Hong Kong, China. This workshop brought together about 150 leading scientists to discuss recent developments and future directions in this new field at the frontiers of chemistry. The proceedings of this workshop, supplemented with invited review articles, will be published as a special issue of *Pure and Applied Chemistry (PAC)*.

Extensive disciplinary and interdisciplinary scientific and mission-oriented work conducted by the Divisions is presented in the Division Presidents' reports, which appear later in the Agenda.

The central issue of science education in general, and education in chemistry in particular, pertains to the preservation and advancement of global human capital. Meaningful contributions to this endeavor constitute a major challenge for the Union. IUPAC, as an international worldwide organization, must consider in this context the diversity of cultural approaches and the different conditions and needs in distant parts of the world. It should be emphasized that chemistry, due to its interdisciplinary nature, provides the basis for scientific training in the natural sciences.

The problems facing the global chemistry education system involve the erosion of scope and quality of science education, resulting in science illiteracy in the developed countries and the need for qualified scientific manpower in less developed countries. The Committee on Teaching of Chemistry (CTC) is involved in aspects of chemistry teaching on the secondary and undergraduate levels. A major focus of the Committee's activities for the past few years has been the development and distribution of information about low-cost

laboratory equipment for secondary schools in developing countries.

## IUPAC'S Publications

The principal output from much of the Union's scientific work is publications, particularly recommendations and reports from our Commissions and Committees, and lectures from IUPAC-sponsored symposia. Our broad publication program includes the journal *Pure and Applied Chemistry*, the news magazine *Chemistry International (CI)*, and a wide range of books, from the basic volumes on symbols, nomenclature, and terminology to compilations of evaluated data and specialty books of all sorts.

A number of significant events occurred in the publications area in 1998–1999. The special issue on “Natural and Anthropogenic Environmental Oestrogens: The Scientific Basis for Risk Assessment” was published as the September 1998 issue of *Pure and Applied Chemistry*. This effort was accomplished in collaboration with the International Union of Toxicology (IUTOX) and the International Union of Pharmacology (IUPHAR) and supported by a grant from ICSU. In addition to the normal print run, the Union paid for an extra 2 000 copies to be printed. Of these, more than 1 000 have been sold to groups and individuals. In addition, copies have been distributed free to members of certain international organizations.

Four new volumes in the Chemistry for the 21<sup>st</sup> Century series have been published since the Geneva General Assembly: *Molecular Electronics, Interfacial Science, Chemical Thermodynamics, and Transition Metal Catalysed Reactions*. Three new nomenclature books were published in this period: *Principles of Chemical Nomenclature: A Guide to IUPAC Recommendations; Compendium of Chemical Terminology, 2<sup>nd</sup> edition; and Compendium of Analytical Nomenclature (Definitive Rules 1997), 3<sup>rd</sup> edition*. The IUPAC-sponsored series on Analytical and Physical Chemistry of Environmental Systems produced two new volumes: *Structure and Surface Reactions of Soil Particles, Vol. 4, and Atmospheric Particles, Vol. 5*.

Paid subscriptions to *PAC* continue to hold up better than for the average scientific journal. There were over 700 paid subscribers to *PAC* in 1998–1999. Twenty-three reports and recommendations and the proceedings of 16 IUPAC-sponsored symposia and conferences were published in *PAC* in 1998. In addition, the proceedings of six symposia were published in *Macromolecular Chemistry and Physics. Chemistry International* is distributed to over 6 000 subscribers, Fellows, and members of IUPAC bodies. This total includes the distribution of almost 400 copies gratis to scientists under 35 years of age in developing countries.

A major change was initiated in 1999 with the January issue of *CI*. From that date, IUPAC has acted as its own publisher. This statement means that IUPAC has taken responsibility for the copy editing, printing, and distribution of *CI*. Each of these functions has been contracted out. The result of this change is a lower cost of production and better control of the finished product.

Based on an analysis of the future of the scientific publishing market, the Committee on Printed and Electronic Publications recommended, and the Executive Committee approved, the change of *PAC* from having an official publisher to being published by IUPAC. The arrangement is similar to that described above for *CI*. The driving force for this change was the desire to achieve greater independence in how the Union approaches electronic publishing. The financial analysis indicated that there was little financial risk in this change.

## Initiatives of Interest to Industry

A significant fraction of IUPAC's work has relevance to the chemical industry. One example is the special issue on “Natural and Anthropogenic Environmental Oestrogens” mentioned above. The special issue constitutes an independent and unbiased contribution from the Union, in its capacity as an international nongovernmental organization, to the continuing debate about the effect of anthropogenic as well as phyto-genic oestrogens on the environment and human health. The chapters, prepared by experts from throughout the world, critically evaluate various aspects of the subject. This special issue should be of interest not only to academic institutions, industry, governmental agencies, and environmental organizations, but also to the public.

A conference on sustainable chemistry, sponsored by IUPAC, was held late in 1998 in Venice, Italy. This conference brought together academic and industrial chemists to discuss new chemistry for producing industrial chemicals using processes that have inherently low environmental impact.

The first IUPAC Workshop on Advanced Materials: Nanostructured Systems, described previously, addressed issues of considerable value for modern industrial applications.

A group of experts, assembled by IUPAC, has written a book, *Drug Metabolism: Databases and High-Throughput Testing during Drug Design and Development*. This volume brings together information on the use of metabolism databases in drug design, on metabolism data acquisition methodologies, and on new equipment. The book was published in the first quarter of 1999.

A special issue of *Pure and Applied Chemistry* de-

voted to the topic of "Oil-Spill Countermeasure Technologies and Response Methods" appeared for January 1999. This review contains 16 chapters, covering the full range of related technologies from booms and dispersants to bioremediation. Special topics such as countermeasures for ice-covered waters and "How clean is clean?" are also covered.

The Committee on Chemistry and Industry (COCI), with its revised Terms of Reference, will continue to strengthen its ties with Committees and Divisions, increase efforts to enroll more Company Associates, continue workshops on safety in chemical production, invigorate the Training Program on Safety, and continue to investigate the feasibility of new programs.

### Dissemination of Information

The IUPAC web site (<http://www.iupac.org>) has been greatly expanded over the biennium. In January 1998, the site was moved from the Royal Society of Chemistry (RSC) server to the Metalabs facility at the University of North Carolina at Chapel Hill (USA). This move included the establishment of the Union's own domain name. The Metalabs facility has a high-speed connection to the Internet (it is part of the Internet backbone) and a set of large, high-speed servers. Response time is excellent, even for overseas locations. The number of visitors to the site has increased from fewer than 3 000 in March 1998 to more than 16 000 in February 1999. Three mirror sites are currently active: the RSC in the United Kingdom, SUNSite Germany, and SUNSite Japan. A mirror site in China is being set up through the kind offices of Prof. Zhang, an elected member of the Bureau.

The web site not only contains all the material in the *IUPAC Handbook*, but also includes a list and description of the current projects being worked on by IUPAC Commissions and Committees, current contact information for members of IUPAC bodies, a complete list of IUPAC publications (including book ordering information), title pages of recent issues of *Pure and Applied Chemistry*, and the complete text of recent issues of *Chemistry International*. In addition, a number of Commissions have either established home pages on the IUPAC web site or moved existing home pages to the IUPAC site. These Commission pages give detailed information about the work of the Commission. An example is mentioned below, the African Network for Valorization of Plant Materials.

### Service of Chemistry

The CHEMRAWN series continues to address issues at the interface of science and society. CHEMRAWN XI was held on 15–20 March 1998 in Montevideo, Uruguay. The subject of the conference was "Latin

American Symposium on Environmental Analytical Chemistry". A Workshop on Environmental Analytical Chemistry was held in conjunction with CHEMRAWN IX. The workshop was organized by the International Organization for Chemistry in Development (IOCD) and partly funded by an ICSU grant to IUPAC. A CHEMRAWN Conference on Green Chemistry is planned for 2000.

The theme of the 15<sup>th</sup> International Conference on Chemical Education, 9–14 August 1998, Cairo, Egypt, was Chemistry and Global Environmental Change. Other IUPAC activities in the education field include the sponsorship of work on inexpensive instrumentation and micro laboratory kits for use by schools in developing countries.

At the Council meeting, the Secretary General will describe a proposed new initiative to encourage career development of young scientists. An IUPAC prize for young scientists, based on their doctoral research, will be awarded annually, with the winners being brought to the IUPAC Congress to receive their prizes and participate in the scientific activities.

I would like to emphasize that the service of chemistry is not a substitute for the advancement of high-level, high-quality international research; rather, it is complementary.

### IUPAC Activities in Less-Developed Countries

IUPAC's international role bears a scientific and moral responsibility to help develop the scientific, educational, and professional training infrastructure in less-developed countries. IUPAC held a joint meeting with the African Association for Pure and Applied Chemistry (AAPAC) in Durban, Republic of South Africa in July 1998, on Chemistry in the Development of Africa, to discuss areas of collaboration. This meeting was organized by Professor P. S. Steyn, member of the Executive Committee, for whose leadership I am grateful.

This fruitful and most instructive meeting discussed human capital development, research infrastructure, reduction of brain drain, bridging the gap between donors and less-developed countries, clean chemical industry, and the environment. In addition to current IUPAC programs for less-developed countries, the meeting initiated an AAPAC–IUPAC joint collaboration in the planning of an electronic communication highway for Africa. One tangible result of this collaboration has been the creation of a web site for the African Network for Valorization of Plant Materials. We have provided server space and technical assistance to help the network set up its web site (<http://www.iupac.org/links/vpma/index.html>). The Union sponsored a report by Dr. Chris Garbers, in partnership with UNESCO, on the state of chemistry in Africa. This report has been extensively distributed to IUPAC mem-

bers and other interested international organizations. Another joint project with UNESCO is the funding of fellowships for students from third world countries to study for six months at the Jawaharlal Nehru Centre for Advanced Scientific Research in India.

A new initiative to promote sponsorship of IUPAC conferences in developing countries will be discussed by the Bureau at Berlin. This initiative will provide funds to help countries that often cannot hold major international conferences to do so. Holding an international conference is an excellent way to help scientists in developing countries maintain the contacts that are a necessary part of participating at a high level in modern chemistry. It also enables young scientists to participate in a major international conference, an opportunity many of them rarely receive.

### Globalization

IUPAC strives toward the globalization of its activities with the participation of the entire world's chemistry community. During the last four years, IUPAC organized a series of meetings to obtain most significant input from leaders in chemistry on four continents, regarding its future science policy, structure, and function.

One of the first steps was to convene, in 1996, meetings in North America and in Europe that brought together leaders in chemistry who were not directly involved with IUPAC but who could help us to develop the programs of the Union so as to meet the perceived needs of the broad community of chemists. Out of these meetings came many ideas that were incorporated into our Strategic Plan. We followed up with a meeting in 1997 to address the advances in chemistry and resulting needs and opportunities in the broad area of Asia (including the Southwest Pacific), and this meeting also helped us to generate new initiatives. In 1998, we met jointly with the African Association of Pure and Applied Chemistry to explore ways in which IUPAC, even with its limited resources, could contribute positively to the advancement of chemistry in a continent where a growing number of well-educated chemists are striving to overcome the impediments in seriously underdeveloped economies. Also in 1998, we had the opportunity to make a short presentation at the meeting of the Federation of Latin American Chemical Societies (FLAQ), and I hope that IUPAC will be able to have a more substantial joint meeting with FLAQ at their conference next year in Lima, Peru.

Last year IUPAC convened the first meeting ever of the Regional Chemical Federations from Europe, Asia,

North America, Latin America, and Africa, and the second such meeting will take place in Berlin. In addition, here in Berlin, we are joining our hosts, the Gesellschaft Deutscher Chemiker, in hosting the biennial meeting of presidents of the world's national chemical societies. Meetings of this sort provide for interchange of ideas, development of strategies by which all participants can contribute to the advancement of the chemical sciences, and initiation of specific programs to share our expertise and resources. I am pleased that IUPAC is playing a central role in coordinating these efforts and in providing a central resource for exchange of information and ideas.

IUPAC attaches great importance to the broadening of its geographical base. IUPAC added three new National Adhering Organizations in 1998: the Chemical Society of Pakistan, the Colegio de Químicos de Puerto

Rico, and the Union of Yugoslav Chemical Societies. It is a privilege to congratulate and felicitate our new National Adhering Organizations and wish fruitful future contributions of their chemical communities to international chemical sciences.

IUPAC added three new Observer organizations in 1998–1999: the Pancyprian Union of Chemists, the Sociedad Cubana de Química, and the Tanzania Chemical Society. The African Association of Pure and Applied Chemistry became an Associated Organization in 1999. It is a pleasure to extend a warm welcome to our new observer and associated organizations.

IUPAC currently has 43 National Adhering Organizations, which include the vast majority of the world's most developed chemistry economies. Yet, there are a significant number of countries that are major contributors to the chemical sciences and to chemical industry but which do not currently adhere to IUPAC. In all our contacts with international chemistry federations and societies, we are continually exploring ways in which such countries can be brought into the IUPAC family. Indeed, as we broaden the scope of the Union's programs, we must make it clear why these countries will benefit from membership in IUPAC.

Currently there are 18 Observer countries, some of which clearly are very close economically to being able to participate fully in IUPAC. There are other members of this group that are currently less developed and less able to take on the financial responsibilities of membership in IUPAC. A large number of other countries currently have no formal association with the Union but might benefit from a closer alliance. Later in this meeting, we shall discuss ways in which we might make such formal association more attractive.





Overall, our message to the world's chemists is one of openness. We are restructuring our scientific programs to permit any scientist anywhere in the world to propose projects that will benefit international science. We have made it easier for top-notch scientists in countries that currently do not adhere to IUPAC to participate in the Union's projects and to serve on its scientific bodies. We have made it clear through our Strategic Plan and through our followup actions that IUPAC believes in the service of chemistry to society, worldwide. We are making strenuous efforts to work cooperatively with the chemical and pharmaceutical industries to provide an independent scientific base that will assist them in bringing the benefits of chemistry to mankind. I believe that IUPAC's new and candid approach to the world chemistry community will pay dividends in years ahead, both to the Union and to the science that we serve.

### Epilogue

The future message of IUPAC should rest on:

- openness to the fast expansion of the borders of the chemical sciences;
- response to conceptual and structural changes in chemical research and technology;
- perpetuation of interdisciplinary unification, high quality, relevance, and the global dimension in activities;
- contribution to the globalization of the scientific endeavor;
- recruiting "human capital" for IUPAC; and
- adherence to the principles, norms, values, and ethics of science.

Chemistry historically emerged and developed as an interdisciplinary scientific field, with a broad definition of its borders. Paraphrasing Linus Pauling's definition of the chemical bond as "whatever is convenient to the chemist to define as a bond", chemistry can be defined as a discipline encompassing all areas which are of interest for chemists and where molecular science makes significant contributions. The rich and diverse world of modern chemistry encompasses remarkable intellectual accomplishments, scientific creativity and originality, and the generation of new knowledge.

The quality, relevance, and remarkable scope of modern chemistry all point toward a bright future of the chemical sciences as a central scientific discipline.

IUPAC serves the international scientific endeavor in the dual function of a basic science and a mission-oriented Union. The Union is in a unique position to contribute to the central interdisciplinary chemical sciences. Strengthening international chemistry, striving toward inspiring high standards of excellence and relevance in academic and industrial research, and promoting the service of chemistry to society and to global issues—these are the visions that shape IUPAC's activities toward the 21<sup>st</sup> century.

### Acknowledgments

I am indebted to all my colleagues in the Union, particularly the present and former Officers and Members of the Bureau and the Executive Director, who have given me invaluable assistance and advice. It is a privilege to extend deep appreciation to the "IUPAC family" and to all the volunteers all around the world, for their personal commitment to the objectives, goals, and activities of IUPAC. Their contributions do and will promote, enhance, and perpetuate the impact of the Union's activities on the international level, both in scope and in intrinsic significance. It is by the expertise and dedication of these extensive and intensive voluntary activities that IUPAC served and will continue to serve, with the proper necessary modifications in its structure and function, the world chemical research and industrial community as the outstanding international authority on the pure and applied chemical sciences.



## News from IUPAC

### Medicinal Chemistry Graduate School Curriculum and Its Contribution to the Pharmaceutical Industry in Japan

Dr. Thomas J. Perun (Tjperun@aol.com), Titular Member and Secretary of the IUPAC Chemistry and Human Health Division and its Medicinal Chemistry Section Committee (VII.M), has helped make it possible for us to reprint with permission the following article, which was originally published in *MedChem News* (Japan), No. 4, November 1998, pp. 21–28. The survey it reports represents the efforts of the Medicinal Chemistry Section's Working Party on Medicinal Chemistry Curriculum to examine the relationship between academia and industry in Europe, Japan, and the United States. We thank the Working Party Chairman, Professor C. R. Ganellin (c.r.ganellin@ucL.ac.uk), and Dr. Toshihiko Kobayashi (KOBAYASHI\_TOSHIHIKO@Lilly.com) for compiling the results of this important survey and for preparing the original article.

#### Introduction

While the relationship between academia and industry is frequently examined from the perspective of research and technical collaborations, it is also important to view it in terms of supply of human resources by academia to meet the demands of industry.

In 1996, the IUPAC Medicinal Chemistry Section initiated, under the leadership of Professor C. R. Ganellin of London University, a survey of the education curriculum as well as the contributions and activities of graduate students in medicinal chemistry. Involved in the survey were participants from Denmark,

France, Germany, Italy, Japan, Spain, Switzerland, the United Kingdom, and the United States.\*

Based on Japan Pharmaceutical Manufacturing Association (JPMA) 1997 data (Figure 1), Japan accounts for 21% of the worldwide pharmaceutical market. Considering the importance of the Japanese market, the IUPAC survey was extended early in 1997 to determine how well pharmaceutical-related academia in Japan contributed to the pharmaceutical industry's current success.

While 30 professors and/or deans kindly responded to the survey despite their busy schedules, the global questionnaire caused inconveniences and difficulties among the responders because the questions were in English, did not reflect the local university system, and were not always self-explanatory.

#### Explanation

Obviously, the Japanese university/college curriculum is different from that in the United States and Europe. About 120 years ago, the pharmaceutical sciences in Japan started using organic chemistry in line with German chemistry. This initial process was further accelerated at the advent of World War I (1914), which halted export of pharmaceuticals from Europe to Japan and, consequently, fostered local firms to manufacture pharmaceuticals.

As post-World War II technological developments were introduced, pharmaceutical sciences in Japan comprehensively developed and diversified through collabo-

\*A separate survey for the United States was conducted by C. R. Ganellin, L. A. Mitscher, and J. G. Topliss (*Med. Res. Rev.* 1998, **18**, 121–137).

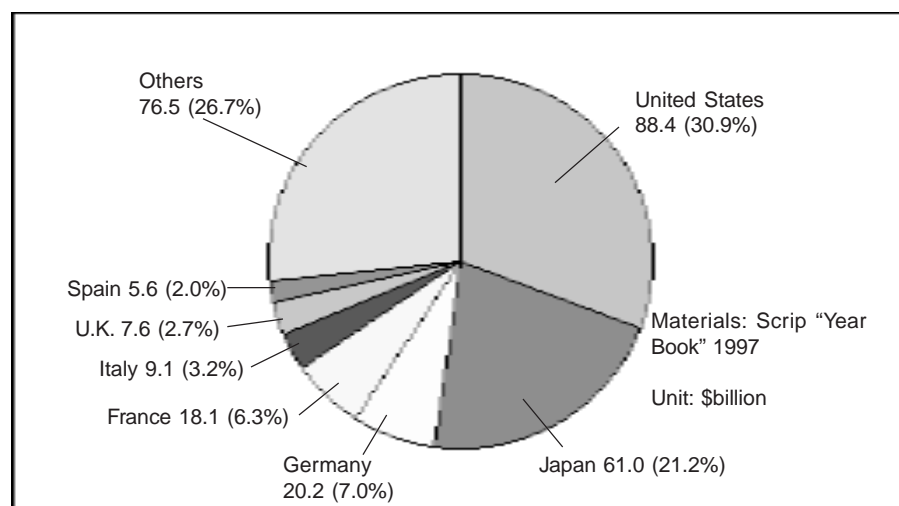


Fig 1. Market Scale in the World of Ethical Drugs

ration with biology. For example, in 1976 the government reformed Patent Law by adopting the “substance” and “use” patent system in addition to the “manufacturing” patent for pharmaceuticals. This reform triggered new challenges for the Japanese pharmaceutical industry, which was plunged into worldwide competition for drug discoveries. As a result, pharmaceutical sciences were necessarily diversified into biology through etiological approaches.

A prototype of the curriculum and organization of the research laboratories at the graduate school of pharmaceutical sciences for the university with the longest history is presented in Table 1.

**Table 1. Research Laboratories at Graduate Schools of Pharmaceutical Sciences**

Laboratories are, in principle, comprised of one professor, one associate professor, and one or two assistant professors as full time staff.

*Molecular Pharmaceutics*

- Department of Medicinal Chemistry
  - Laboratory of Organic and Medicinal Chemistry
    - Synthetic Medicinal Chemistry
    - Synthetic Organic Chemistry
    - Synthetic Natural Products Chemistry
  - Department of Bioorganic Chemistry
    - Laboratory of Natural Products Chemistry
      - Bioanalytical Chemistry
      - Bioorganic and Medicinal Chemistry
  - Department of Chemical Biology

*Functional Pharmaceutics Group*

- Department of Biomolecular Functions
  - Laboratory of Neurobiophysics
    - Physical Chemistry
    - Protein Structural Biology
  - Department of Cell Biochemistry
    - Laboratory of Health Chemistry
      - Physiological Chemistry
      - Developmental Biochemistry
      - Cancer Biology and Molecular Biology
  - Department of Immunology
  - Department of Biochemistry

*Life Pharmaceutics*

- Department of Medical Pharmaceutics
  - Laboratory of Biopharmaceutics
    - Chemical Pharmacology
    - Biomedical Genetics
    - Neuropathology and Neuroscience
    - Pharmacology and Toxicology
  - Department of Clinical Pharmacokinetics

There are three types of universities/colleges in the pharmaceutical sciences in Japan. To understand and interpret the survey outcomes properly, a brief explanation is useful.

*Type 1*

Seven Imperial Universities were established before the end of World War II. Six of the seven have a graduate school and undergraduate faculty of pharmaceutical sciences. These institutions are primarily research oriented. Academic staff are registered at the graduate school and also serve as undergraduate faculty.

*Type 2*

Of the more than 100 National and Public Universities established after World War II, 11 have a faculty of pharmaceutical sciences. These universities also include a research-oriented graduate school. Academic staff, however, are registered as faculty of pharmaceutical sciences and simultaneously direct research at the graduate school of the same university.

*Type 3*

There are hundreds of private universities and/or colleges in Japan, and 29 have a faculty of pharmaceutical sciences. These institutions are principally education oriented (fostering qualified pharmacists at hospitals and pharmacies) but maintain a research orientation through the graduate school. All academic staff are registered as faculty.

Several definitions of medicinal chemistry can be found in the literature, but they vary widely. In fact, quite different interpretations exist for each definition. For this survey, we proposed a rather flexible definition: medicinal chemistry is chemistry with medicinal objectives and goals. This definition encompasses chemistries relevant to and/or involved in the process of medicinal discovery, development, or commercialization, including organic/synthetic chemistry; biochemistry/pharmacology; pharmacokinetics and pharmacodynamics; formulation; drug design; computational chemistry; combinatorial chemistry, etc. In other words, medicinal chemistry would be a technical expertise endorsed by deep knowledge and technology specified in organic/synthetic chemistry, biochemistry/pharmacology, pharmacokinetics and pharmacodynamics, formulation, computational chemistry, combinatorial chemistry, etc.

## Survey Outcome and Analysis

**Q 1:** How many postgraduate students and postdoctorals are currently enrolled for studies considered primarily involving medicinal chemistry?

### Answer

	Type 1	Type 2	Type 3
Number of Replies	3	3	7
M.Sc.	182	192	198
Ph.D.	86	24	28
Subtotal	268	216	226
Postdoctoral	11	0?	13
Total	279	216	239
Average Number per Graduate School	93	72	34
*Virtual Total	93 x 6	72 x 11	34 x 29
Number	558	792	986
Virtual Grand Total		> 2 000	

\*Virtual Total means an estimated total number of all graduate students and postdoctorals.

### Example:

Type 3: Average (34) x total schools (29) = 986

**Finding 1:** More than 2 000 postgraduate students (M.Sc. and Ph.D.) in Pharmaceutical Sciences are involved in Medicinal Chemistry Research or Medicinal Innovations annually in Academia.

**Q 2:** What is the total number of postgraduates (M.Sc. and Ph.D.) irrespective of medicinal chemistry?

### Answer

	Type 1	Type 2	Type 3
Number of Replies	3	3	7
M.Sc. + Ph.D.	280	107	65
			102
	150	149	52
	164	200	80
			36
			40
			50
Total	594	456	425
Average per School	198	152	61
*Virtual Total	198 x 6	152 x 11	61 x 29
	1 188	1 672	1 769
Virtual Grand Total		about 4 500	

\*Virtual Total means an estimated total number of graduate students of total graduate schools (6 + 11 + 29 = 46)

### Example:

Type 1: Average (198) of the replies (3) x graduate schools (6) = 1 188

**Finding 2:** Referring to Finding 1, about 45% of the total postgraduates in Pharmaceutical Sciences are involved in Medicinal Chemistry or Medicinal Innovation in academia.

**Q 3:** What is the B.Sc. specialization of the graduate students?

### Answer

	Type 1	Type 2	Type 3
Number of Replies	3	3	7
B. Pharmaceutical Sciences	259	208	211
Other B. Sc	3	0?	13
B. Sc Other Countries	6	8	2
	268	216	226

**Finding 3:** Almost 95% of graduate students have an educational background in the pharmaceutical sciences. The graduate school is not diversified in terms of B. Sc. background; rather, the undergraduate training of the students is very homogeneous. However, this finding might reflect a well-diversified faculty education in almost all natural sciences.

**Q 4:** How many M.Sc./Ph.D. graduates have, in the last 5 years, had their primary focus on medicinal chemistry, and what is their present occupation?

### Answer

	Type 1	Type 2	Type 3
Number of Replies	3	3	6
	MSc/PhD	MSc/PhD	MSc/PhD
Total Number Graduated	535	435	340
Virtual Number Graduated	535 x 1/3 x 6	435x1/3 x 11	340x1/6x 29
	1 069	1 595	1 643
Postdoc Research (Home)	11	0	2
Postdoc Research (Abroad)	13	2	3
Academic/Teaching Position	16	4	15
Drug Analysis	18	20	0
DMPK	52	34	5
Patents or Information	11	0	3
Synthetic Med Chem	65	54	28
Computer-Assisted Drug Design	31	3	3
Drug Registration or Clinical Research	18	28	0
Marketing	4	0	10
Sales Representatives	2	0	15
Other	0	5	34
Unknown	9	4	25
Number Going to Industry	358	318	241
% Going to Industry	67%	73%	71%
	(358/535)	(318/435)	(241/340)
*Virtual Number to Industry	358 x 1/3 x 6	318x1/3 x 11	241x1/6x 29
	716	1 166	1 165
Virtual Grand Total		about 3 000	

\*Virtual Number means an estimated number of total graduate schools.

### Example:

Type 2: Average (1 318 x 1/3) x number of graduate schools (11) = 1 166

**Finding 4:** Benchmarking M.Sc./Ph.D. graduates from the last 5 years and their current jobs is so difficult and complex that it might be dangerous to comment in detail on the outcomes; however, about 70% joined industry. It is also a new phenomenon for M.Sc./Ph.D. graduates to begin their careers in the development and commercialization aspects of medicinal innovation, such as clinical research and drug registration as well as marketing and sales.

**Q 5:** How many of the above postdocs have Ph.D. degrees in organic chemistry?

This question is not self-explanatory in terms of Organic Chemistry in the faculties of Pharmaceutical Sciences, Sciences, Agricultural Sciences, or Technology. While some reengineering is proceeding in the university system, almost all universities in Japan still have the faculty system.

**Finding 5:** No clear database was obtained.

**Q 6:** Do you have short courses on aspects of drug design available to medicinal chemists in the pharmaceutical industry?

**Answer**

	Type 1	Type 2	Type 3
Number of Replies	3	3	7
Yes	2	2	2

**Finding 6:** The "Yes" responses do not imply that the schools have official courses available to industry. It seems reasonable to infer that through symposia, seminars, and scientific meetings, there are opportunities for academia to provide advice on drug design.

**Q 7:** How many academic staff are engaged in the education of M.Sc. and Ph.D. students, and how many academic staff from outside are involved?

**Answer**

	Type 1 (Graduate School)	Type 2 (Faculty)	Type 3 (Faculty)
Number of Replies	3	3	7
Academic Staff Internal*	93	57	63
	55	59	104
	57	48	69
			66
			65
			60
			71
Subtotal	205	164	498
Average per School	68	55	71
Virtual Total Staff	68 x 6	55 x 11	71 x 29
	408	605	2 059
Virtual Grand Total	about 3 000		

\*Reasonable and meaningful database on external numbers not obtained this time.

**Finding 7:** Frankly, this question was controversial in terms of numbers involved in medicinal chemistry, because it is almost impossible to estimate all individual staff percentages engaged in medicinal chemistry; therefore, the data obtained indicate a total number of academic staff in graduate school and faculty of Pharmaceutical Sciences. It should be noted that these staff are also deeply involved in teaching undergraduates, who total around 8 000/year in Japan. The Japanese undergraduate curriculum (4 years) comprises General Study (less than 1.5 years) and Pharmaceutical Sciences (more than 2.5 years), so that a total number of undergraduates of Pharmaceutical Sciences would be

more than 30 000 in Japan. One academic staff member per 10–11 undergraduate students would be considered quite high compared with the ratio for other faculties.

**Q 8:** Do your Ph.D. students attend lecture courses?

**Answer**

	Type 1	Type 2	Type 3
Number of Replies	3	3	7
Yes	1	3	4

**Finding 8:** Attendance at lecture courses depends on school policy.

**Q 9:** Do your Ph.D. students have to develop their presentation skills?

**Answer**

	Types 1, 2, and 3
Total Number of Replies	13
Present a Seminar	13
Write a Report (apart from Thesis)	13
Present a Communication at a Scientific Conference	13

**Finding 9:** Research quality and productivity are appraised not only internally but also externally, and communication is essential. All schools are cognizant of fostering the skills of Ph.D. students in communication as well as in research itself.

## Recommendation

The survey results should be very helpful and useful for overseas medicinal chemists in understanding medicinal chemistry and pharmaceutical sciences in terms of the relationship between academia and industry in Japan. However, an additional survey with more systematic and customized questionnaires is recommended in Japan. It is hoped that this issue will be discussed at a meeting of all deans of graduate schools and faculties of pharmaceutical sciences in Japan.

## Acknowledgments

We are highly grateful to all professors and/or deans who kindly responded to our rather time-consuming questionnaires. Also, many thanks are due to Prof. K. Koga (Tokyo), Prof. Y. Sugiura (Kyoto), Prof. T. Shioiri (Nagoya), and Prof. T. Kunieda (Kumamoto) for their kind discussion in analyzing and commenting on the survey results.

## Report on the IUPAC/ISO REMCO/ BAM/EUROLAB-D Workshop on Proper Use of Environmental Matrix Reference Materials, Berlin, Germany, 22–23 April 1999

Dr. A. Fajgelj (Quality Assurance Supervisor, International Atomic Energy Agency Laboratories, A-2444 Seibersdorf, Austria; E-mail: A.Fajgelj@iaea.org), Chairman of the IUPAC Interdivisional Working Party on Harmonization of Quality Assurance Schemes for Analytical Laboratories, has submitted the following report:

IUPAC's Interdivisional Working Party on Harmonization of Quality Assurance Schemes for Analytical Laboratories, ISO's Committee on Reference Materials (ISO/REMCO), the German Federal Institute of Materials Research and Testing (BAM), and EUROLAB-D of Germany, have cooperated in organizing a workshop on "Proper Use of Environmental Matrix Reference Materials". The workshop was sponsored by the Institute for Reference Materials and Measurements (IRMM), European Commission, Belgium; the Laboratory of the Government Chemists (LGC), UK; and Promochem, Germany. It was supported by EURACHEM and hosted by BAM in Berlin, Germany on 22 and 23 April 1999.

In principle, the aim of the workshop was to increase awareness of how various types of reference materials (RMs) should be utilized. For this purpose, experts from different RM-producing organizations selected some of their existing RMs and focussed on the following topics: a) how the materials were characterized; b) how the materials were certified (absolute method, laboratory intercomparison, selected laboratories, certification criteria etc.); c) information about the assigned property values of traceability and uncertainty; and d) how the materials should be utilized properly by analysts in view of points a, b and c. Some lectures also included information about new strategies and plans in RM production. Information about ISO REMCO and COMAR (a reference materials database) was also given.

The following RM producers were represented at the workshop: Canada Center for Mineral and Energy Technology (CANMET)-Canadian Certified Reference Materials Project (CCRMP); Chinese National Research Center for Certified Reference Materials (GWB); Faculty of Agronomy and Institute of Chemical Technology, Czech Republic; Federal Institute of Materials Research and Testing (BAM), Germany; Laboratory of the Government Chemists (LGC), UK; Institute for Reference Materials and Measurements (IRMM), European Commission; International Atomic Energy Agency (IAEA); National Institute of Materials and

Chemical Research (NIMC), Japan; National Institute of Standards and Technology (NIST), United States; National Office of Measures (OMH), Hungary; and National Metrological Institute (NMI), Netherlands. In addition, some posters were presented and an exhibition of RMs was organized during the workshop.

From the general discussion, the following points can be summarized:

- Matrix reference materials are a specific type of reference materials. Within matrix reference materials, sub-groups also exist, i.e., gaseous RMs, environmental and biological matrix RMs, alloys, coal RMs, etc. To a large extent, differences in types of RMs are reflected in possible methods of characterization and certification of RMs and, consequently, in utilization of RMs in the analytical process.
- A large majority of matrix RMs is characterized through interlaboratory comparisons. Such materials do not always fulfill the criteria for the established traceability of the assigned property values. Most often, the uncertainty associated with the assigned property values is not quantified as required by the ISO Guide on *Expression of Uncertainty in Measurement* (GUM), Geneva, 1993.
- There is an urgent need for an up-to-date guidance on certification principles that would cover the above points (traceability and uncertainty). The new version of ISO Guide 35, *Certification of Reference Materials: General and Statistical Principles*, which is currently under revision by ISO/REMCO, will close this gap. Its first draft is expected to be available next year.
- Matrix RMs are frequently prepared for different purposes, i.e., calibration (gaseous RMs, stable isotope ratio RMs, alloys, etc.). The majority of matrix RMs available currently and in the future is and will be suitable for method validation, quality assurance, and quality control purposes, but not for calibration. Thus, the intended use of matrix RMs needs to be specified clearly by the producer.
- The instructions on proper use of reference materials given in ISO Guide 33 are of a general nature, because they are intended to cover all types of certified reference materials. Because ISO Guide 33, *Uses of Certified Reference Materials*, is also not in accordance with the GUM, it urgently needs to be revised. Additional guidance has to be prepared by the producers for each RM separately to reflect the intended use of the RM.
- It is the responsibility of an RM user to obtain the necessary information on the quality of an RM before selecting and using it for a specific purpose in the laboratory.

According to responses to a questionnaire distributed during the workshop, urgent and future needs for the following types of RMs were identified:

Matrix	Analyte
Surface, ground, and wastewater	PCBs, PAHs, and pesticides
Aqueous solutions	Diverse pollutants from the atmosphere
Marine material, e.g., fish tissue	Trace elements
Soils and sediments	Trace metals, PCBs, and PAHs
Vegetables	Pesticides (different European limits)
Gas	Organics

The workshop was attended by more than 100 participants from 34 countries. Full text of the lectures given by 17 presenters can be found in a special series proceedings book entitled *The Use of Matrix Reference Materials in Environmental Analytical Processes* (ISBN 0 85404 739 5) published by The Royal Society of Chemistry (see previous announcement in *Chemistry International*, 1999, Vol. 21, No. 3, p. 87).

---

## Highlights from the Web

This article was contributed by Webmaster Dr. Glenn Carver (Glenn.Carver@atm.ch.cam.ac.uk), Chairman Prof. J. Alistair Kerr (A.KERR@bham.ac.uk), and Subcommittee Member Dr. R. A. Cox (rac26@cam.ac.uk) on behalf of the IUPAC Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry (of the Commission on Chemical Kinetics, I.4).

### A Web Site for the IUPAC Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry

The World Wide Web (WWW) has become an almost indispensable tool for scientists in recent years. The emergence of new technologies, particularly those that are platform-independent, and the provision of web front-ends to powerful databases have added to the importance of the web as an information medium. Until recently, the IUPAC Subcommittee of Gas Kinetic Data Evaluation for Atmospheric Chemistry (of the Commission on Chemical Kinetics, I.4) has relied on the more traditional method of publishing their reviews in the prestigious *Journal of Physical and Chemical Reference Data* (JPCRD), and this medium has served the community well.

Over the past 22 years, the Subcommittee has published seven major evaluations in JPCRD, with a further update "in press" at the moment. These evaluations consist of data sheets containing kinetic and photochemical information on the elementary reactions that occur in the earth's atmosphere. At present, the complete database contains over 800 such reactions, which form the basis of the chemical mechanisms used by atmospheric modelers in predicting, for instance, the effects of releasing anthropogenic chemicals into the atmosphere.

In relation to traditional methods of disseminating such information to the scientific community, the web offers several key advantages, such as greatly improved availability and distribution coupled with a much reduced time to make the evaluations available. The acceptance of the Adobe Portable Document Format (PDF) as a *de facto* standard for publishing documents on the web has also been an important development.

It is for these reasons that the Subcommittee has developed a web site, which it hopes will become a valuable resource for the atmospheric chemistry community. With so much current interest in tropospheric and stratospheric chemistry, it is important to make new evaluations available as rapidly as possible—a key objective in setting up the new web site. The web site went online in February 1999 and has attracted significant interest from all over the world, particularly from Europe, the United States, and Canada. At present, a single PDF document containing an amalgamation of the more recent summary tables published in JPCRD is available, but the Subcommittee plans to use the web site as its primary means of disseminating future evaluations to the user community and also, eventually, to make the data sheets of individual reactions available. For the near future, this availability will continue to be in the form of PDF documents; however, it is hoped ultimately to provide a database with search facilities that would provide hyperlinked kinetic data in HTML format, not unlike the NIST Webbook database.

The web site has been established at the Centre for Atmospheric Science, University of Cambridge, England, UK at <http://www.iupac-kinetic.ch.cam.ac.uk/>. It also allows visitors to subscribe to a mailing list that has been provided to allow the Subcommittee to notify interested users when the web site is updated with new information or additional data. At the time of writing,

this mailing list has 100 subscribers. We invite readers to visit the web site and comment on its usefulness and on future developments.

Dr. Glenn Carver<sup>1</sup>, Prof. J. Alistair Kerr<sup>2</sup>, and Dr. R. A. Cox<sup>1</sup>

<sup>1</sup>Centre for Atmospheric Science, University of Cambridge, Lensfield Road, Cambridge CB2 1EP, England, UK

<sup>2</sup>School of Chemistry, University of Birmingham, Birmingham B15 2TT, England, UK

---

## New Projects

Visit <http://www.iupac.org/projects/> for complete information and further links.

### Revision and Updating of IUPAC Red Book I

Given developments in both inorganic and organic chemical nomenclature in the nine years since the current Red Book I (*Nomenclature of Inorganic Chemistry, Recommendations 1990*) was published, there is a need to make this popular reference work consistent with current practice.

IUPAC has approved a project to revise and update Red Book I that will also include a simplification of some sections (e.g., covering the solid state and stereochemistry). The revised volume is to be supplemented by other publications on more advanced areas of inor-

ganic nomenclature (e.g., Red Book II—in preparation). The revision of Red Book I is planned for completion in 2000 and is being coordinated by Professor Neil G. Connelly with participation of all members of IUPAC's Commission on Nomenclature of Inorganic Chemistry (II.2). Comments from the chemistry community are welcomed and should be addressed to Professor Neil G. Connelly, School of Chemistry, University of Bristol, BS8 1TS, England, UK; Tel.: +44 117 928 8162; Fax.: +44 117 929 0509; E-mail: [neil.connelly@bristol.ac.uk](mailto:neil.connelly@bristol.ac.uk).

See [http://www.iupac.org/divisions/current\\_projects/1999/2\\_1\\_99.html](http://www.iupac.org/divisions/current_projects/1999/2_1_99.html) for project description and update.

**Professor Neil Connelly, Titular Member  
IUPAC Commission on Nomenclature of  
Inorganic Chemistry (II.2)**

---

## Provisional Recommendations

### IUPAC Seeks Your Comments

In this section, we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry*, and synopses of these are published in *Chemistry International* as recent reports.

If you would like to comment on the provisional recommendations, please write to your nearest national/regional center to request a copy of the full report. Copies are not available from the IUPAC Secretariat. The most recent list of national/regional centers appeared in *Chemistry International* 1997, **17**, 141. This information is also available on the IUPAC web site: <http://www.iupac.org/>.

**Analytical Chemistry Division. Commission on Microchemical Techniques and Trace Analysis; Chemistry and the Environment Division. Commission on Fundamental Environmental Chemistry; Chemistry and Human Health Division. Commission on Toxi-**

**cology—IUPAC Guidelines for Terms Related to Chemical Speciation and Fractionation of Trace Elements: Definitions, Structural Aspects, and Methodological Approaches**

The effect of trace elements in living systems, in food, and in the environment depends on the chemical form in which the element enters the system and the final form in which it is present. It is necessary to determine the various forms in which the trace element is present to meet pressing occupational, environmental, regulatory, and economic needs for understanding mobility, bioavailability, storage, retention, and toxicity. In an attempt to end the present confusion regarding the usage of the term speciation, three IUPAC Commissions collaborated to evaluate this issue. This paper presents definitions for the concepts related to speciation of trace elements, more particularly speciation analysis and species in chemistry. A categorization of species is proposed according to the isotopic composition of the element, its oxidation state, the inorganic compounds and organic complexes of which the trace element forms a part, and its occurrence as an organometallic compound



or as a macromolecular complex. A general outline is given of the analytical methods used in speciation analysis, including (with definition) fractionation. An outline of methodology of dynamic metal speciation analysis and of methodological approaches available for speciation analysis is also presented.

Comments by 29 February 2000 to Dr. Rita Cornelis, Instituut voor Nucleaire Wetenschappen, Faculteit van de Wetenschappen, Rijksuniversiteit-Gent, Proeftuinstraat 86, B-9000 Gent, Belgium. Tel.: +32-9-264-66-26; Fax: +32-9-264-66-99; E-mail: rita.cornelis@rug.ac.be.

### **Chemistry and Human Health Division. Clinical Chemistry Section. Commission on Toxicology—Biological Monitoring for Exposure to Volatile Organic Compounds (VOC)**

This paper deals with the appropriate application of biological monitoring (BM) for exposure to volatile organic chemicals (VOC). Sampling guidelines, approved analytical procedures, as well as quality control systems besides detailed aspects for the interpretation of biomonitoring data, together with a compilation of international biological action values for VOC exposure at the workplace (e.g., BAT, BEI<sup>®</sup>) and state-of-the-art reference values are outlined or referred to in this review for recommendation and as guidelines for health professionals in occupational and environmental settings.

VOC are frequently encountered at the workplace, in daily routines, and in widely used consumer products. They cover a broad spectrum of chemical classes with different physicochemical and biological properties. Due to their volatility, inhalation is a prominent route of exposure, but many of them can, in addition,

be taken up by skin absorption quite readily. BM—that allows one to assess the integrated exposure by different routes, including inhalation and concomitant dermal and oral uptake—provides especially for VOC a helpful tool for relating exposure to body burden and possible health effects; however, because of the different toxicological profiles of VOC, no uniform approach for BM can be recommended.

VOC in blood, besides urinary VOC metabolites, are most often applied for BM, and limit values for workplace exposure have been established for many VOC. In this field, profound analytical methodology and extensive experience exist for reliable routine application in numerous international scientific laboratories. Contamination and loss of VOC during specimen collection, storage, and sample treatment are the most important uncertainty compounds for analytical quantification of VOC in blood.

For interpretation of the analytical results, appropriate time of sampling according to toxicokinetics of the compound is crucial due to VOC elimination, with often short but differing biological half-times. Life style factors (such as smoking habits, alcohol consumption, and dietary habits), workload, personal working habits, exposure to VOC mixtures besides endogenous factors (such as genetic polymorphism for VOC-metabolizing enzymes, body mass) contribute to BM results and have to be considered in detail. Future analytical work should focus on the improvement of analytical methodology of VOC determination in body fluids at low-level environmental exposure and evaluation of corresponding reference intervals.

Comments by 29 February 2000 to Dr. R. Heinrich-Ramm, Zentralinstitut für Arbeitsmedizin, Adolph-Schönfelder-Str. 5, D-22083 Hamburg, Germany. Tel.: +49-40-428-63-2791, Fax: +49-40-428-63-2785, E-mail: heinrich-ramm@uke.uni-hamburg.de.

---

## *New Books and Publications*

### **New Book from IUPAC**

---

***Transition Metal Catalysed Reactions. Chemistry for the 21<sup>st</sup> Century Monograph. Edited by S.-I. Murahashi and S. G. Davies. Blackwell Science (1999), pp. x + 1-497, ISBN 0-632-05126-4, USD 160.***

IUPAC conceived the Chemistry for the 21<sup>st</sup> Century series to bring to the attention of a wide audience the role that chemistry will play in the future development of society and the preservation of our environment. This imaginative series has therefore set out to produce volumes that contain essays on topics within chemistry

written by experts, with the nonexpert but interested individual as the largest readership. The interested individuals may comprise those who wish to study chemistry, make use of it, or enter into research on the subject.

From practical, economic, and environmental standpoints, transition metal catalysed reactions are set to dominate the chemical industry in the 21<sup>st</sup> century. These reactions will have an impact on the production of fine chemicals, pharmaceuticals, agrochemicals, polymers, etc. It is not surprising, therefore, that the field of transition metal catalysis has been, and will remain, at the forefront of both the academic and industrial research arenas.

Transition metal catalysis offers the possibility of achieving complex organic synthesis transformations that combine complete efficiency (100% yield) with complete chemical and stereochemical control (one product only) while minimizing or even eliminating reagents, waste products, and solvents. This chemical Utopia is achievable but will require an ever-more sophisticated understanding of the interactions of transition metal species and their substrates, investigations of which will continue well into, if not throughout, the 21<sup>st</sup> century. This monograph offers a snapshot of some of the progress that has been made to date in a few selected areas of transition metal catalysis while providing tantalizing glimpses of what is still to be achieved.

Solvents play an enormous part in chemical reactions, profoundly influencing the rate and selectivity of catalysts. Ikariya and Noyori demonstrate that catalysis of organic reactions in supercritical fluids, rather than conventional organic solvents, can offer enormous advantages in terms of high reactivity, high selectivity, and operational simplicity. Beletskaya and Cheprakov show the advantages in terms of reactivity and turnover of changing from phosphine-based catalysts in organic media to phosphine-free systems in water. The advantages of the aqueous medium in palladium catalysed reactions are emphasized further by Genet, Savignac, and Lemaire-Audoire.

Transition metal catalysis continues to have a major impact in the area of carbon-carbon bond-forming processes. Grigg and Sridharan illustrate how palladium catalysts facilitate the assembly of complex hetero- and carbocycles from simple building blocks via cascade reactions involving molecular queuing processes. Meijere and Brase describe how domino-type synthetic sequences involving palladium catalysed cross-coupling reactions lead to complex structures in single operations involving multiple carbon-carbon bond formations. Lu and Ma show how palladium catalysis transforms simple acyclic allylic 2-alkynoate esters to  $\alpha$ -alkylidene- $\gamma$ -butyrolactones. Mortreux discusses the influence of the ligand environment on the reactivity and selectivity of nickel catalysed carbon-carbon bond-forming processes with olefins and dienes as substrates.

Aromatic substitution involving the formation of carbon-carbon bonds has been revolutionized by transition metal catalysis. Catellani gives a general account of such substitution reactions, while Kakiuchi and Murai describe highly efficient methods for the addition of unactivated aromatic carbon-hydrogen bonds across olefins, and Reetz discusses new palladium catalysts for Heck reactions of unreactive aryl halides.

Allyl groups are precursors to many other functional groups and this fact, coupled with the ready availability of both nucleophilic and electrophilic allyl equiva-

lents, makes allylation reactions one of the most studied areas of transition metal catalysis. Cross-coupling allylations and the allylations of carbonyl compounds, including the enantioselective addition of allyl stannanes to aldehydes in the presence of a chiral Lewis acid, are described by Yanagisawa and Yamamoto. The enantioselective catalysis of allylic substitutions with palladium complexes of phosphooxazolidines is discussed by Helmchen, Steinhagen, and Kudis.

Ali and Alper describe the synthesis of lactones and lactams via ring expansions and cyclizations where the carbonyl group in the product is derived from carbon monoxide or an equivalent thereof. Doyle and Forbes describe the enantioselective cyclopropanations, carbon-hydrogen insertion, and ylides of diazoketones catalysed by rhodium complexes. Recent advances in organocopper chemistry are addressed by Alexakis, who discusses copper(I)-promoted asymmetric transformations, and by Lipshutz, who demonstrates the synthetic power and potential of cyanocuprates.

The use of organotransition metal complexes to promote the formation of carbon-oxygen bonds is an area of enormous potential. Palladium catalysed oxidations of alkenes are discussed by Hosokawa and Murahashi. New strategies for hydrogen peroxide activation are reviewed by Moiseev, while organic oxidations promoted by organorhenium oxides as catalysts are detailed by Herrmann and Kuhn. Dixneuf and Bruneau illustrate the use of ruthenium catalysts to promote the addition of carboxylic acids across alkynes to generate vinyl esters and ethers.

The formation of carbon-silicon bonds is covered by Hayashi, who summarizes the development of chiral monodentate phosphine ligands to promote the asymmetric hydrosilylation of olefins catalysed by palladium. Suginome and Ito describe the transition metal catalysed addition of disilanes across olefins, which involves the formation of two carbon-silicon bonds in one reaction.

Transition metal catalysts can be used to promote the formation of organoboron compounds via carbon-boron bond formation, as well as the reactions of organoboranes to produce carbon-carbon bonds. Suzuki reviews both these areas of organoboron chemistry. Finally, the mechanism and synthetic potential of catalytic hydroboration are detailed by Brown et al.

Transition metal catalysed reactions are already established as an important part of the synthetic chemist's arsenal. It is hoped that this monograph will serve as a catalyst to encourage the revelation, throughout the 21<sup>st</sup> century, of their as yet untapped real potential for synthesis.

**S. -I. Murahashi, Department of Chemical Science and Engineering, Osaka University, Osaka, Japan**

**S. G. Davies, Dyson Perrins Laboratory, University of Oxford, Oxford, England, UK**

## New Book from The Royal Society of Chemistry

---

***Drugs: Photochemistry and Photostability*. Edited by A. Albini and E. Fasani, University of Pavia, Italy.**

Since Pasteur's discovery in 1846, scientists have been aware that many drugs are photoreactive, but until recently, research in this area had been somewhat limited. However, since the introduction of acutely sensitive analytical methods, the realization of the need to identify the photochemical properties of a potential drug as early in its development as possible, and the increased attention to the phototoxic effect of drugs, more details are becoming available.

*Drugs: Photochemistry and Photostability* presents the basic elements of the science, and serves as an excellent introduction to this emerging field of photochemistry. Detailed experimental conditions for photostability studies are given, along with a discussion of the recently implemented International Conference on Harmonisation (ICH) Guidelines for drug photostability.

With contributions from international experts in the field and including a comprehensive literature review, this book provides all the up-to-date information needed by researchers in many fields, especially medicinal and pharmaceutical chemistry.

### *Contents*

Photochemistry of Drugs: An Overview and Practical Problems; Medicinal Photochemistry (An Introduction with Attention to Kinetic Aspects); Photoreactivity of Selected Antimalarial Compounds in Solution and in the Solid State; Photochemistry of Diuretic Drugs in Solution; New Results on the Photoinstability of Antimycotics; Photoreactivity *versus* Activity of a Selected Class of Phenothiazines: A Comparative Study; Photoprocesses in Photosensitizing Drugs Containing a Benzophenone-Like Chromophore; Photostability of Coumarin; Photostabilities of Several Chemical Compounds Used as Active Ingredients in Sunscreens; An Analytical and Structural Study of the Photostability of Some Leukotriene B<sub>4</sub> Antagonists; Molecular Mechanisms of Photosensitization Induced by Drugs on Biological Systems and Design of Photoprotective Systems; A Comparison between the Photochemical and Photosensitizing Properties of Different Drugs; Photostability of Drug Substances and Drug Products: A Validated Reference Method for Implementing the ICH Photostability Study Guidelines; The Elaboration and Application of the ICH Guideline on Photostability: A European View; Selecting the Right Source for Pharmaceutical Photostability Testing; Design and Validation Characteristics of the Environmental Chambers for Photostability Testing; Design Limits and Qualifi-

cation Issues for Room-Size Solar Simulators in a GLP Environment; Actinometry: Concepts and Experiments; *trans*-2-Nitrocinnamaldehyde as Chemical Actinometer for the UV-A Range in Photostability Testing of Pharmaceuticals; Subject Index.

ISBN: 0 85404 743 3; viii + 326 pages; Price: GBP 59.50; Special Publication No. 225, Hardcover, 1998.

To order, contact Sales and Customer Care, The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, England CB4 0WF, UK; E-mail: [sales@rsc.org](mailto:sales@rsc.org); Tel.: +44 1223 420066; Fax: +44 1223 423429; Web site: <http://www.rsc.org> or <http://www.chemsoc.org/>.

## New Publications from AOAC International

---

***Analytical Techniques for Inorganic Contaminants*, by Kim Anderson**

This manual is intended to provide chemists and analysts in the fields of veterinary toxicology, agriculture, and environmental chemical analysis with a compilation of new, selected, and proven techniques for determining inorganic compounds with detailed insight and comprehensive step-by-step instructions. These techniques were chosen on the basis of recent technical and instrumental advancements for a particular inorganic analyte in the selected matrices.

Three introductory chapters contain useful, practical, and technical information that may be critical for both successful employment in an analytical profession and in the operation of an analytical laboratory. This information includes concepts of quality control and quality assurance, as well as instrumental and preparation techniques.

Analytical techniques constitute the second part of the book, in which certain elements and ions are discussed for at least one matrix. The chapters are divided into a section on metals in animal tissues, plants and feeds, environmental waters, and soils and sediments. The selected techniques presented have proven reliability and were tested under the rugged conditions of a commercial laboratory.

For more information, contact AOAC International, 481 North Frederick Avenue, Suite 500, Gaithersburg, MD 20877-2504. E-mail: [pubsales@aoac.org](mailto:pubsales@aoac.org); Tel.: +1 301 924 7077; Fax: +1 301 924 7089; Web site: <http://www.aoac.org/>.

***Pesticides Laboratory Training Manual (Spanish Language Translation)*. Edited by Clifton E. Meloan.**

This manual was originally prepared in 1996 under cooperative agreements among the U.S. Agency for

International Development (USAID), the U.S. Environmental Protection Agency (EPA), and the U.S. Food and Drug Administration (FDA). These agencies recognize the importance of the pesticide analytical laboratory in promoting safe, effective use and management of pesticides. The translation was prepared by Rebecca Weinstein.

The manual covers techniques and methods considered to be basic tools needed by a pesticide laboratory to conduct general residue analysis satisfactorily at the parts-per-billion range. For situations in which the analysis is for official purposes, the book covers proper documentation of the process from beginning to end. It covers sample collection; sample preparation; extraction, cleanup, and concentration; instrumentation; separation and detection; data handling and reporting; and quality control, quality assurance, and safety.

Each chapter offers many examples, as well as numerous review questions and answers. In addition, appropriate appendices are found at the end of each chapter, allowing the user to remove a complete chapter and study it separately.

#### **FDA Bacteriological Analytical Manual (BAM), 8<sup>th</sup> Edition, Current through Revision A, 1998**

This revised edition of the authoritative *BAM* is now available on CD-ROM in an easy-to-use format that allows the user to search by words or phrases. This CD-ROM contains the most current methodology used in FDA laboratories for detection of microorganisms and certain of their metabolic products in foods, beverages, and cosmetics.

The current version of the 8<sup>th</sup> Edition contains revised material including updates to selected *BAM* chapters on *Campylobacter*, Staphylococcal enterotoxins, yeasts and molds, and parasitic animals in foods; updated appendices feature commercially available test kits and Most Probable Number enumeration of bacteria. New material also incorporates editorial corrections to the 8<sup>th</sup> Edition published in 1995 and an up-to-date list of contact personnel for each chapter, including e-mail addresses.

The CD-ROM uses the latest Adobe Acrobat™ software, which allows users to view and print fully formatted text—complete with formulas, tables, and images. Acrobat also contains hypertext links that allow users to click on highlighted references to jump easily to other chapters and related material.

In addition to the *BAM*, the CD-ROM features the FDA *Foodborne Pathogenic Microorganisms and Natural Toxins Handbook*, also known as the “Bad Bug Book”, which provides basic facts regarding foodborne pathogenic microorganisms (bacteria, viruses, and parasites) and natural toxins. The intent of each chapter is to provide essential information about these organisms

and toxins, including their characteristics, habitat or source, associated foods, infective dose, characteristic disease symptoms, complications, recent and/or major outbreaks, and any susceptible populations.

#### **New Publications from the World Health Organization**

##### ***Chrysotile Asbestos, Environmental Health Criteria No. 203***

1998, xxi + 197 pages (English with summaries in French and Spanish), ISBN 92 4 157203 5, CHF 42.-/USD 37.80; In developing countries: CHF 29.40, Order no. 1160203. WHO distribution and sales, CH-1211 Geneva 27, Switzerland; E-mail: Publications@who.ch; Tel.: +41 22 791 24 76; Fax: +41 22 791 48 57.

This book evaluates the risks to human health and the environment posed by exposure to chrysotile asbestos. Also referred to as white asbestos, chrysotile is a naturally occurring fibrous hydrated magnesium silicate mineral having many commercial applications. Chrysotile is released to the environment from industrial sources. In addition, natural weathering of serpentine rock results in emissions to air and water.

Although the health risks associated with mixed exposures to the main commercial forms of asbestos (crocidolite, amosite, and chrysotile) are known, the evaluation was undertaken in response to the continuing widespread production and use of chrysotile following the International Labor Organization's recommendation to discontinue use of crocidolite asbestos, and taking into consideration that amosite is virtually no longer exploited. The asbestos cement industry is singled out as by far the largest current global user of chrysotile fibers. Main applications include production of corrugated sheets; flat sheets and building boards; slates; molded goods, including low-pressure pipes; and high-pressure water pipes. Chrysotile is also used, in much smaller quantities, in the manufacturing of friction products, gaskets, and asbestos paper.

In assessing the health risks posed by chrysotile asbestos, the evaluation faced a number of methodological problems, including the industry-specific nature of exposure-response relationships, and difficulties with the interpretation of exposure data from older studies, which did not differentiate between exposures to amphiboles (crocidolite, amosite) and serpentine (chrysotile) fibers. Conclusions and recommendations reflect the consensus reached by a large group of scientists selected solely on the basis of their contribution to the open scientific literature. Some 500 references to the literature are included in this carefully documented assessment.

The report opens with a review of methods used for collecting and analyzing samples, followed by a dis-

discussion of sources of occupational and environmental exposure. Studies indicate that exposure may occur during mining and milling, processing of asbestos into products, construction and repair activities, and transportation and disposal of waste products containing chrysotile. Exposure to chrysotile fibers during construction, maintenance, or demolition of buildings is judged likely to entail high risks. Subsequent sections summarize levels of chrysotile detected in the environment and in various occupational settings, and review what is known about the uptake, clearance, retention, and translocation of inhaled or ingested fibers.

The most extensive sections review the results of toxicity studies conducted in laboratory mammals and *in vitro* test systems and of epidemiological studies in occupationally exposed workers. For humans, the report concludes that exposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer, and mesothelioma in a dose-dependent manner, and confirms previous findings that asbestos exposure and cigarette smoking interact to increase the risk of lung cancer greatly. The report did not identify a threshold for carcinogenic risks. Evidence that exposure to chrysotile increases the risk of cancer at sites other than the lung was judged inconclusive.

To reduce the health risks posed by exposure, the report calls for the use of engineering and other control measures in workplace settings where occupational exposure continues to occur, and further concludes that, where safer substitute materials are available, these should be considered for use.

***The Use of Essential Drugs, Eighth Report of the WHO Expert Committee (including the Revised Model List of Essential Drugs), Technical Report Series No. 882***

1998, vi + 77 pages (available in English; French and Spanish in preparation), ISBN 92 4 120882 1, CHF 19.-/USD 17.10; In developing countries: CHF 13.30, Order no. 1100882.

This report presents and explains the tenth model list of essential drugs issued by WHO as part of its efforts to extend the benefits of modern drugs to the world's population. Intended to guide the selection of drugs in countries where the need is great and resources are small, the list identifies a core group of prophylactic and therapeutic substances judged capable of meeting the vast majority of health needs and thus deserving priority in purchasing decisions and procurement schemes. The model list also serves as an information and educational tool for health professionals and consumers, and facilitates the development of treatment guidelines, national formularies, information for patients, and other measures to improve drug use.

WHO model lists, the first of which was issued 20

years ago, are regularly updated to ensure that recommendations are in line with the latest data on the comparative safety, efficacy, and costs of specific drugs, as well as their relevance to priority health problems. Factors of stability, quality control, and international availability are also considered when validating and revising the lists.

The first part of the report provides updated information on several components of national drug policy necessary to ensure that essential drugs, corresponding to essential health needs, are available at all times in adequate amounts and in the proper dosage. Information includes selected requirements for quality assurance, advice on the compilation of shorter lists of essential drugs for use in primary health care, strategies for postmarketing surveillance and reporting of adverse drug reactions, and the role of relevant and reliable drug information in promoting the rational use of drugs. Also discussed is the growing problem of resistance to some of the widely available and relatively cheap antimicrobials included in the list, and the corresponding need for reserve antimicrobials.

The tenth WHO model list of essential drugs is presented in the second part, together with an explanation of changes made when revising the list. Organized according to therapeutic group, the list includes information on route of administration, dosage forms, and strengths for each of 306 drugs. To qualify for inclusion, a drug must be supported by sound data demonstrating safety, efficacy, and consistent performance in a variety of medical settings.

Among the most significant changes in the list are the inclusion of zidovudine for preventing the transmission of HIV from mothers to newborn infants, the addition of drugs for the treatment of opportunistic infections in immunocompromised patients, the replacement of several anti-infective drugs with safer and more effective preparations, and the addition of a new drug, triclabendazole, for the treatment of liver and lung flukes. The list also includes changes in line with the latest treatment regimens recommended in several WHO-sponsored programs for disease control.

## Other Books and Publications

---

***Adsorption and its Applications in Industry and Environmental Protection. Edited by A. Dabrowski.***

*Volume I: Applications in Industry*

Volume I contains a brief review of adsorption history and its development for practical purposes up until now. It also presents some important information on adsorbents and catalysts, as well as on the methods of their characterization. The part of this volume dealing

with practical industrial applications includes chapters presenting advanced technical tools for high-capacity adsorption separation of liquid and gas mixtures, development of new adsorbents for removal of hazardous contaminants from combustion flue gases and wastewaters, degasification of coal seams, and fabrication of inorganic membranes and their applications. A comprehensive review is also included on contemporary utility of self-assembled monolayers, adsorption proteins and their role in modern industry, adsorption methods in technology of optical fiber glasses, sol-gel technology, solid desiccant dehumidification systems, etc. The articles give both the scientific backgrounds of the phenomena discussed and emphasize their practical aspects. The chapters give not only brief current knowledge about the studied problems, but are also a source of topical literature on the subject. A comprehensive bibliography on adsorption principles, design data, and adsorbent materials for industrial applications for the period 1967–1997 concludes the book.

#### *Volume II: Applications in Environmental Protection*

Volume II contains chapters written by authoritative specialists on the broad spectrum of environmental topics in order to find a way for intense anthropogenic activities to coexist with the natural environment. The book highlights a wide spectrum of themes referring to the environmental analysis and control and molecular modeling of both sorbents and environmentally friendly adsorption processes. Also covered are new trends in applications of colloidal science for protecting soil systems, purification and production of drinking water, water and groundwater treatment, new environmental adsorbents for removal of pollutants from wastewaters and sewage, selective sorbents for hot combustion gases, some corrosion aspects, and ecological adsorption of heating and cooling pumps. The volume concludes with a comprehensive bibliography, which includes the period 1967–1997, on adsorptive separations, environmental applications, PSA, parametric pumping, ion-exchange, and chromatography. All articles give both the scientific background of the phenomena discussed and indicate practical aspects.

Volume I: ISBN 0 444 50165 7; 1090 pages; NLG 750.00/USD 431.00; Hardbound, 1999.

Volume II: ISBN 0 444 50166 5; 1090 pages; NLG 750.00/USD 431.00; Hardbound, 1999.

2-Volume Set: ISBN 0 444 82828 1; NLG 1 200.00/USD 689.50.

To order, contact Direct Marketing Department, Elsevier Science, P.O. Box 880, 1000 AW Amsterdam, Netherlands, E-mail: [nlinfo-f@elsevier.nl](mailto:nlinfo-f@elsevier.nl); Tel.: +31 20 485 3757; Fax: +31 20 485 3432; Web site: [www.elsevier.nl/locate/isbn/0444501657](http://www.elsevier.nl/locate/isbn/0444501657) or [www.elsevier.nl/locate/isbn/444501665/](http://www.elsevier.nl/locate/isbn/444501665/). In all corre-

spondence, please quote reference 030-1325-9.

#### ***The Systematic Nomenclature of Inorganic Chemistry (German)*, by W. Liebscher and E. Fluck**

While it is difficult to synthesize a new compound, it is still more difficult to give it a systematic name. Both these authors served for many years as members of IUPAC's Commission on Nomenclature of Inorganic Chemistry (II.2). They review the latest recommendations for inorganic nomenclature in this new introductory-level book that should be useful to every chemist.

#### *Contents*

Rules of Chemical Nomenclature and Terminology; Nomenclature Conventions (Nomenclature Systems; Proportions; Oxidation States and Valences; Prefixes; Suffixes; Descriptors; Loci; Punctuation; Ranking Sequences); Chemical Elements and Compounds (Chemical Elements Including Allotropic Forms; Names and Symbols; Isotopes; Allotropes; Compounds; Construction of Names; Ions; Substituents; Radicals; Ligands); Neutral Molecules (Substitution Nomenclature; Names of Hydrides; Coordination Nomenclature; Organometallic Species); About Stoichiometry-Based Names (Components and Ranking Sequence; Salts; Acids; Oxo-Acids and their Salts; Multinuclear Oxo-Acids; Special Cases for Phosphorus and Arsenic; Bases; Addition Compounds; Borohydrides); Borohydrides and Related Compounds (Borohydride Nomenclature; Polyhedral Clusters; Substitution and Exchange of Boron Clusters; Ions; Substituents); Isotope-Modified Compounds (Classification, Symbols, Formulas, Names); Stereoisomers (Stereodescriptors, Configuration Index, Chirality Symbols); Chains and Rings; Solids; Glossary.

ISBN 3 540 63097 X; 388 pages; 7 figures; 33 tables; 557 formulas; 31 illustrations; Price: DM 128; 1999.

To order, contact Springer-Verlag Berlin, Heidelberger Platz 3, D-14197 Berlin, Germany, E-mail: [orders@springer.de](mailto:orders@springer.de); Tel.: +49 30 82787 715 or +49 30 82787 232; Web site: <http://www.springer.de/customers/index.html/>.

---

## Awards and Prizes

### Ronald Breslow and Murray Moo-Young Win American Chemical Society Awards

Professors Ronald Breslow and Murray Moo-Young, both active IUPAC Members, have won prestigious awards from the American Chemical Society this year.

Prof. Breslow, Chemistry and University Professor at Columbia University in New York City and Titular Member of IUPAC's Organic Chemistry Division (III) Committee as well as Member of the Subcommittee on Bioorganic Chemistry, was honored with the Priestley Medal, the highest ACS award, during the society's national meeting last spring in Anaheim, CA, USA. Previously the winner of awards too numerous to cite here, Breslow is noted for his pioneering research in nonbenzenoid aromatic chemistry; enzyme-catalyzed reactions; biomimetic approaches to synthesis of enzymes and complex carbohydrates; and synthesis of simple anticancer compounds consisting of two solvent-like molecules linked together with a carbon chain. Prof. Breslow says he continues to "like to make new molecules that we think will have interesting properties".

Prof. Moo-Young, Professor of Chemical Engineering at the University of Waterloo, Ontario, Canada and a National Representative for IUPAC's Commission on Biotechnology, was presented with the Marvin J. Johnson Award in Microbial and Biochemical Technology at the spring ACS national meeting. Prof. Moo-Young has been at the forefront of establishing quantitative correlations for mass transfer, mixing, and kinetics in bioreactor systems. He is also noted for the development of process biotechnologies that employ fragile cell cultures in the production of drugs, biopolymers, and foodstuffs. His recent research has focused on elucidating bioremediation enhancement. In that work, he has used physicochemical pretreatment strategies to control and abate environmental pollution.

### Researchers Benefit from Chemical Structure Association Trust Awards and Bursaries

We thank Dr. Wendy A. Warr (Wendy A. Warr & Associates, 6 Berwick Court, Holmes Chapel, Cheshire CW4 7HZ, England, UK; Tel./Fax: +44 1477 533837; E-mail: wendy@warr.com; Web site: <http://www.warr.com>), Chairman of the IUPAC Committee on Printed and Electronic Publications (CPEP), for arranging for the preparation of the following article by Dr. William G. Town (billt@chemweb.com), Chairman of the Chemical Structure Association Trust.

### Origin of the Chemical Structure Association (CSA) Trust

The Chemical Structure Association (CSA) Trust was founded in response to two related problems: universities having trouble funding research, and industry having difficulty recruiting suitably trained personnel. It is a registered charity that aims to promote research and development in the field of storage, processing, and retrieval of information about chemical structures, reactions, and compounds. It was established in 1998 with money from the Chemical Structure Association (although the Trust is a legally separate entity).

Research in the field of chemical structure handling has shown considerable success in recent years, and results have been rapidly reflected in practice. Both similarity and 3D structure searching have been well established for some time, even though much of the research behind them was only carried out in the 1980s. There is still a pressing need for such research in the chemical information arena. Combinatorial chemistry and molecular diversity are just two examples of exciting, ground-breaking fields. The CSA Trust exists to support such development, particularly research, attendance at conferences, etc., which might otherwise have been impossible because of lack of funds.

### Annual Awards, Awardees, and Areas of Research

Since its inception, the Trust has supported a very broad range of research by scientists from tremendously diverse backgrounds and geographical locations. The annual awards and bursaries have by no means been limited to the United States and Western Europe; a number of Russian projects have been assisted, for instance. Award winners have ranged from an American undergraduate who has been engaged in a year's research at Moscow State University, to a Chinese predoctoral student working at the University of North Carolina, to a researcher from the National Chemical Laboratory in Pune, India. Specific areas of research have included quantitative structure-activity relationships (QSAR) and combinatorial chemistry, chemical literature data extraction, computer-assisted synthesis, genetic algorithms, neural networks, reaction databases, and quantum chemistry.

A CSA Trust Annual Award is USD 3 200/GBP 2 000, which the winner can put toward attending a relevant conference, toward travel (to collaborate with another research group, for instance), or toward hardware or software to assist with a research project. The award is not usually given for hardware and software alone, how-



**Recipients of 1999 CSA Trust Bursaries at the 5th International Conference on Chemical Structures in Noordwijkerhout, Netherlands**

ever. In return, it is simply asked that the winners should supply a report within a year of the award, giving some detail of how the money was spent, in what way the conference was useful, etc.

#### **Application Procedures**

Any prospective applicants should not hesitate to get in contact with the Trust; they could find themselves pleasantly surprised at how the Trustees can be of assistance. An application should include the following:

- statement of academic qualifications,
- details of relevant work,
- description of research recently completed by the applicant,
- purpose for which the award is required, and
- letters from two academic referees supporting the application.

The clarity and relevance of the statement of the purpose for which the award is to be used is especially important, as this is crucial in deciding between applicants.

#### **Travel Bursaries**

Besides the CSA Trust Annual Award, there are other bursaries available, too, for attendance at certain designated conferences and, indeed, at any conference relevant to the aims of the Trust. These bursaries are mainly offered to those who wish to submit a paper or poster and who cannot meet their own conference expenses. Applications for a bursary should contain the following:

- brief biography,
- details of the applicant's current research,

- details of the conference and its relevance to that research,
- title of any paper or poster the applicant may wish to present, and
- letter of recommendation from a supervisor or colleague.

#### **Financial Supporters of the Trust**

A number of organizations with an interest in chemical information have supported the Trust financially, including the American Chemical Society, the BASIC Group, Chemical Abstracts Service, the Chemical Notation Association, Derwent, FIZ CHEMIE BERLIN, GlaxoWellcome, Hoffman-La Roche, Pfizer, Unilever, Wendy Warr & Associates, and Zeneca. The Trust is also always eager to supplement this group and to bring on board new organizations to support the cause financially or to help with the running of the Trust. Support for the Trust is not simply a question of donating money, though, of course, that is always encouraged and welcomed; introducing others to the Trust, sponsoring an event, or even mailing publicity material can all help greatly to raise awareness and assist those who could make good use of an award. The Trust is run by an international board of Trustees from industry and academia, including well-known names from such organizations as Chapman & Hall, ChemWeb, Committee on Data for Science and Technology (CODATA), FIZ CHEMIE BERLIN, GlaxoWellcome, Hampden Data Services, Questel.Orbit, Rohm and Haas, and UMI.



## Comments from Trust Award and Bursary Winners

Some comments from award and bursary winners' reports:

"This award has been a great help for assisting my research and made it possible for me, a predoctoral student, to attend these scientific conferences."—Weifan Zheng, University of North Carolina, USA.

"[The conference] offered a good coverage of the trends in the field, and there were plenty of opportunities for stimulating discussions on existing problems and available solutions...It was a great opportunity for me to present some of our recent work in computational chemistry and to exchange ideas and opinions with other scientists."—Horst Bögel, University of Halle, Merseburg, Germany.

"The session on Molecular Modeling and Managing Three-Dimensional Structures was probably my personal favorite, with some excellent speakers and informative talks...I found the conference interesting, enjoyable, and definitely thought-provoking, with a wide range of computational topics on the leading edge of chemical research...If given the opportunity, I would definitely attend the Fifth Conference [on Chemical Structures] and would like to thank the CSA Trust for enabling me to attend this year."—Jon Baber, University of Leeds, UK.

"I had never previously presented a poster, so this was an excellent opportunity to learn how to create a readable poster, and how to lure people over to look at it...[The conference] also gave me a chance to see presentations of exciting work in the broad area of chemical structures, which may influence my choice of specialist discipline for graduate school and beyond."—Kevin Jernigan, University of Arizona, Tucson, AZ, USA.

### Contacting the Trust

All those with any interest in applying for an award or bursary or in supporting the CSA Trust are welcome to contact the Secretary (Mrs. J. E. Ash, The Roundel, Frittenden, Cranbrook, Kent TN17 2EP, England, UK; E-mail: ash@euronet.nl; Tel./Fax: +44 1580 852270) or visit the CSA Trust web site (<http://www.chemistry.de/CSA-TRUST/>).

## CNC/IUPAC Travel Awards Announced

This article is paraphrased from the May 1999 issue of *Canadian Chemical News* (Volume 51, No. 5, pp. 44–45).

The Canadian National Committee for IUPAC (CNC/IUPAC) established a program of Travel Awards in 1982. These awards are financed by the Gendron Fund (administered by the Canadian Society for Chemistry, CSC), supplemented by funds donated by CNC/IUPAC's Company Associates. The purpose of the awards is to help young Canadian chemists and chemical engineers (within 10 years of gaining their Ph.Ds) present a paper at an IUPAC-sponsored conference outside continental North America. Typically, six or seven awards of CD 1 000–1 500 are made each year.

Applications are now invited for the 2000 Travel Awards competition. They should include a curriculum vitae, the name of the conference and its importance to the applicant, plus any other pertinent information or supporting documents. Five copies of the application should be sent to the chair of the travel awards committee: Verdene H. Smith, Jr., Department of Chemistry, Queen's University, Kingston, ON, K7L 3N6, Canada. The deadline for receipt of applications is 15 October 1999.

A list of eligible conferences may be found on the IUPAC web site (<http://www.iupac.org/symposia/2000.html>) or at the back of this issue. Awards are made to attend the conference identified in the application, and no changes are allowed.

Winners of the 1999 CNC/IUPAC Travel Awards are John Brennan, McMaster University, Hamilton, ON (Analytical Science into the Next Millennium, SAC99, 25–30 July 1999, Dublin, Ireland); R. Stephen Brown, Queen's University, Kingston, ON; François Caron, Atomic Energy of Canada Ltd., Chalk River, ON (SAC99); Cathleen Crudden, University of New Brunswick, Fredericton, NB; Andrew MacMillan, University of Toronto, Toronto, ON; Michael Wolf, University of British Columbia, Vancouver, BC (1<sup>st</sup> IUPAC Workshop on Advanced Materials, WAM1: Nanostructured Systems, 14–18 July 1999, Hong Kong, China); and Mark Workentin, University of Western Ontario, London, ON.

---

## Conference Announcements

### 8<sup>th</sup> Southeast Asia Western Pacific Regional Meeting of Pharmacologists, 1–5 November 1999, Tapei, Taiwan

---

This meeting is being organized by the Pharmacological Society located in Taipei in collaboration with the Chinese Physiological Society, the Toxicological Society of Taiwan, the Pharmaceutical Society of the Republic of China, and the National Research Institute of Chinese Medicine. The Southeast Asia Western Pacific (SEAWP) societies form a Regional Member of the International Union of Pharmacology (IUPHAR).

For more information, contact 8<sup>th</sup> SEA/WPRMP c/o TCM, P.O. Box 68-439, Tapei, Taiwan, E-mail: [tcm@ms5.hinet.net](mailto:tcm@ms5.hinet.net); Tel.: +886 2 2523 6017; Fax: +886 2 2537 7479.

### Symposium and Exhibition on "Gas Analysis", 7–9 November 1999, Amsterdam, Netherlands

---

This symposium and exhibition, organized by ISO/TC 158 "Analysis of Gases", gives participants the opportunity to exchange knowledge and collect information on market and research developments in the field of gas analysis. Attendees will meet people from different areas of industry and research, such as air quality, natural gas, and process gases. The two-day symposium will have five (parallel) sessions on the following subjects:

- state-of-the-art in equipment and current instrumentation
- traceability, validation, accreditation, and measurement accuracy
- calibration gases
- validation of analytical methods in natural gas

For additional information, contact Ms. C. Dobbelaar, NNI, P.O. Box 5059, NL-2600 GB Delft, Netherlands, E-mail: [connie.dobbelaar@nni.nl](mailto:connie.dobbelaar@nni.nl); Tel.: +31 15 2 690 330; Fax: +31 15 2 690 190.

### International Congress on Frontiers in Pharmacology and Therapeutics in the 21<sup>st</sup> Century, 1–4 December 1999, New Delhi, India

---

The Indian Pharmacological Society is organizing this broad-based international pharmacology congress to mark the end of the century.

For further details, contact Professor S. K. Gupta, Congress Secretariat, Department of Pharmacology, All

India Institute of Medical Sciences, Ansari Nagar, New Delhi 100 029, India, E-mail: [skgupta@medinst.ernet.in](mailto:skgupta@medinst.ernet.in); Tel: +91 11 659 3633/659 3282; Fax: +91 11 686 2663.

### International Conference on Residues of Veterinary Drugs in Food (EuroResidue IV), 8–10 May 2000, Koningshof, Veldhoven, Netherlands

---

This conference has as its theme "Residues in Food: An Item for Inspection Research and the Pharmaceutical Industry". It is a follow-up to former EuroResidue conferences held in 1990, 1993, and 1996.

For further information, contact Dr. L. A. van Ginkel, EuroResidue Foundation, c/o RIVM, P.O. Box 1, NL-3720 BA Bilthoven, Netherlands, E-mail: [euroresidue@rivm.nl](mailto:euroresidue@rivm.nl); Tel: +31 30 274 2613; Fax: +31 30 274 4403; Web site: [www.rikilt.dlo.nl/euroresidue/](http://www.rikilt.dlo.nl/euroresidue/).

### International Conference on Transport Processes in Inorganic Materials— Fundamentals to Devices, 28 May–2 June 2000, Venice (Jesolo Beach), Italy

---

This conference has as its main objectives:

- understanding of microscopic mechanisms of transport in different inorganic materials
- assessing the role of transport in materials reactivity, synthesis, and processing
- exploring transport mechanisms that affect materials properties and behavior under operating conditions
- exploiting the role of transport processes in a number of advanced technologies of current or emerging interest

Papers are solicited in, but are not limited to, the following general areas:

- mass and charge transport mechanisms
- role of transport in materials reactivity, synthesis, processing, and properties
- application of transport studies to industrial problems

For further information, contact CIMTEC-Transport Phenomena Conference, P.O. Box 174, 48018 Faenza, Italy, Fax: +39 0546 664138.

74<sup>th</sup> Colloid and Surface Science  
Symposium (Colloid 2000),  
18–21 June 2000,  
Bethlehem, Pennsylvania, USA

---

This symposium, sponsored by the American Chemical Society (ACS) Division of Colloid and Surface Chemistry, will be held at Lehigh University. Papers are being solicited for the technical program in the following areas:

- thin layers
- membranes and separations
- colloidal phenomena
- polymer colloids
- biocolloids and biointerfaces
- complex fluids
- colloids and interfaces in environmental processes
- catalysis surface centers and mechanisms

The symposium will also feature plenary speakers, general papers, and a poster session.

*For further information, contact Professor Mohamed S. El-Aasser, Department of Chemical Engineering, Lehigh University, 111 Research Drive, Bethlehem, PA, USA 18015, E-mail: mse0@lehigh.edu; Tel: +1 610 758 4470; Fax: +1 610 758 5880.*

7<sup>th</sup> World Congress on Clinical Pharmacology and Therapeutics (CPT 2000),  
15–20 July 2000, Florence, Italy

---

This IUPHAR Congress is being organized by the Section of Clinical Pharmacology of the Italian Pharmacological Society on behalf of the Division of Clinical Pharmacology of IUPHAR. On this occasion, the Congress is being organized jointly with the 4<sup>th</sup> Congress of the European Association of Clinical Pharmacology, and it is unique in that respect. Over 3 000 delegates are expected to attend. Satellite meetings and sponsored symposia will also be held in conjunction with the Congress.

*For further information, contact Professor Emilio Perucca, General Secretary, Clinical Pharmacology Unit, University of Pavia, Piazza Botta 10, 27100 Pavia, Italy and CPT 2000, Institute of Pharmacology, Policlinico Borgo Roma, 37134 Verona, Italy, E-mail: gpvelo@farma.univr.it; Tel.: +39 45 50 04 08; Fax: +39 45 58 11 11; Web site: <http://www.newtours-cmo.it/cpt2000/>.*

13<sup>th</sup> International Congress on  
Rheology, 20–25 August 2000,  
Cambridge, England, UK

---

This quadrennial congress brings together from all over the world, scientists and engineers who are directly or indirectly concerned with rheology. In over 50 years, this is only the second time that the congress has been held in the United Kingdom. The meeting is organized by the British Society of Rheology on behalf of the European Society of Rheology. The range of topics covered is broad and includes minisymposia on computational rheology, pharmaceuticals, cosmetics and foods, suspensions and colloids, polymer solutions, polymer melts, solids rheology and composites, rheometry and related physical techniques, microstructural modeling, flow instabilities, process engineering, foams, emulsions and surfactants, non-Newtonian fluid mechanics, granular materials, and jamming.

*For more information, contact Dr. D. M. Binding, Congress Administrator, Department of Mathematics, University of Wales, Aberystwyth SY23 3BZ, Wales, UK, E-mail: [rheology2000@aber.ac.uk](mailto:rheology2000@aber.ac.uk); Tel: +44 1970 622775; Fax: +44 1970 622777; Web site: <http://abbey4.swan.ac.uk/rheology2000/>.*

12<sup>th</sup> International Symposium on  
Homogeneous Catalysis,  
27 August–1 September 2000,  
Stockholm, Sweden

---

This symposium brings together industrialists and academics to discuss recent advances in fundamental catalysis and how these may be applied to new industrial processes. Previous meetings in this series have taken place in St. Andrews, Scotland, UK (1998); Princeton, NJ, USA (1996); Jerusalem, Israel (1994); and Amsterdam, Netherlands (1992). Stockholm University will host the 12<sup>th</sup> International Symposium on Homogeneous Catalysis.

*For additional information, contact Agneta Sjogren, The Swedish Chemical Society, Wallingatan 24, 3tr, SE-111 24 Stockholm, Sweden, E-mail: [agneta@chemsoc.se](mailto:agneta@chemsoc.se); Tel: +46 8 411 52 80; Fax: +46 8 10 66 78.*

## 24<sup>th</sup> Latin American Congress of Chemistry, 15–19 October 2000, Lima, Peru

This congress, also organized as the 21<sup>st</sup> Peruvian Congress of Chemistry, is jointly sponsored by La Sociedad Química del Peru and Federacion Latinoamericana de Asociaciones Químicas (FLAQ). Featured symposia will cover materials science, chromatography, atmospheric and environmental chemistry, and natural products. The scientific program will consist of contributed papers in the following areas:

- chemistry education
- chemistry as a basic science
- atmospheric and environmental chemistry
- natural products
- biochemistry
- chemistry of health and nutrition
- electrochemistry and corrosion
- catalysis and adsorbents
- industrial chemistry

The last three days of the congress will also feature QUIMITEC 2000, a modern exhibition of chemical technology.

For additional information, contact Nadia Gamboa, 24<sup>th</sup> Latin American Congress of Chemistry, Chemical Society of Peru, Av. Nicolas de Aranibar 696 – Santa Beatriz, Lima, Peru, E-mail: [ngamboa@pucp.edu.pe](mailto:ngamboa@pucp.edu.pe); Tel: +51 1 4723925; Fax: +51 1 2659049.

## 7<sup>th</sup> International Frumkin Symposium on Basic Electrochemistry for Science and Technology, 23–28 October 2000, Moscow, Russia

This symposium, to be held at the Klyazma Resort near Moscow, will focus on the following topic areas:

- structure and properties of electrified interfaces
- charge transfer in condensed media
- transport phenomena in electrochemical systems
- electrochemistry and new materials
- bioelectrochemistry

The symposium is being organized by the Russian Academy of Sciences (Division of General and Technical Chemistry, The A. N. Frumkin Institute of Electrochemistry, and the Scientific Council on Electrochemistry) and the Lomonosov Moscow State University (Department of Chemistry, Chair of Electrochemistry). Sponsors include the International Society of Electrochemistry and the Editorial Board of the Russian Journal of Electrochemistry.

For more information, contact, Professor Boris M. Grafov (Chairman, 7<sup>th</sup> International Frumkin Symposium), The Frumkin Institute of Electrochemistry, Russian Academy of Sciences, Leninskii prospekt 31, Building 5, Moscow 117071, Russia, E-mail: [symp@netra.elchem.ac.ru](mailto:symp@netra.elchem.ac.ru); Tel: +7 095 952 46 48; Fax: +7 095 952 08 46; Web site: <http://www.elchem.ac.ru/symp/>.

---

## Conference Calendar

Visit <http://www.iupac.org> for complete information and further links.

**NEW** designates a new conference since the last issue.

1999

### Colloquium Spectroscopicum Internationale

5–10 September 1999  
31<sup>st</sup> Colloquium Spectroscopicum Internationale 1999, Ankara, Turkey.  
Prof. Dr. O. Yavuz Ataman,  
Department of Chemistry, Middle East Technical University, 06531 Ankara, Turkey.  
Tel.: +90 312 210 3232  
Fax: +90 312 210 1280  
E-mail: [xxxicsi@rorqual.cc.metu.edu.tr](mailto:xxxicsi@rorqual.cc.metu.edu.tr)

### Macromolecule-Metal Complexes

5–9 September 1999  
8<sup>th</sup> International Symposium on Macromolecule-Metal Complexes (MMC-VIII), Tokyo, Japan.  
Prof. Eishun Tsuchida, Department of Polymer Chemistry Waseda University Toyko 169-8555, Japan.  
Tel.: +81 3 5286 3148  
Fax: +81 3 3205 4740  
E-mail: [teruyuki@mn.waseda.ac.jp](mailto:teruyuki@mn.waseda.ac.jp)

### Organic and Organoelement Chemistry

6–11 September 1999  
Horizons of Organic and Organoelement Chemistry, to the memory of Prof. A. N. Nesmeyanov, on the 100<sup>th</sup> anniversary of his birth, Moscow, Russia.  
Prof. Y. N. Bubnov, INEOS, Vavilov str. 28, Moscow.  
Tel.: +7 (095) 135 6165  
Fax: +7 (095) 135 5085  
E-mail: [dir@ineos.ac.ru](mailto:dir@ineos.ac.ru)

## Chemistry and the Internet

25–27 September 1999  
ChemInt'99—Chemistry and the Internet, Georgetown University, Washington DC, USA.

*Dr. Stephen R. Heller, NIST/SRD, 820 Diamond Avenue, Gaithersburg, MD 20899-2310 USA.*

*Tel.: +1 301 975 3338*

*Fax: +1 301 926 0416*

*E-mail: srheller@nist.gov*

## Toxicology

6–10 November 1999  
4<sup>th</sup> Congress of Toxicology in Developing Countries, Antalya, Turkey.

*Prof. Semra Sardas, Gazi University, Faculty of Pharmacy Toxicology Department, 06330, Hipodrom, Ankara, Turkey.*

*Tel.: +90 312 212 30 09*

*Fax: +90 312 222 23 26*

*E-mail: ek03-k@tr-net.net.tr*

2000

## Bio-Organic Chemistry

30 January–4 February 2000  
5<sup>th</sup> IUPAC Symposium on Bio-Organic Chemistry (ISBOC-V), New Delhi, India.

*Prof. S. Ranganathan, Biomolecular Research Unit, Regional Research Laboratory, Trivandrum 695 019, India.*

*Tel.: +91 471 491 459*

*Fax: +91 471 490 186*

## High-Temperature Materials Chemistry

10–14 April 2000  
10<sup>th</sup> International Conference on High-Temperature Materials Chemistry, Aachen, Germany.

*Prof. Klaus Hilpert, Forschungszentrum Jülich GmbH, Institut für Werkstoffe der Energietechnik (IWE 1), 52425 Jülich, Germany.*

*Tel.: +49 2461 61 3280*

*Fax: +49 2461 61 3699*

*E-mail: k.hilpert@fz-juelich.de*

## How to Apply for IUPAC Sponsorship

To apply for IUPAC sponsorship, conference organizers should complete an Advance Information Questionnaire (AIQ). The AIQ form is available at <http://www.iupac.org> or by request at the IUPAC Secretariat, and should be returned between 2 years and 12 months before the conference. Further information on granting sponsorship is included in the AIQ and available online.

## Mycotoxins and Phycotoxins

21–25 May 2000  
10<sup>th</sup> International IUPAC Symposium on Mycotoxins and Phycotoxins, Sao Paulo, Brazil.  
*Dr. Myrna Sabino, Instituto Adolfo Lutz, AV Dr. Arnaldo 355, Sao Paulo, Brazil, 01246-902.*  
*Fax: +455 (11) 853 3505*  
*E-mail: Myrna@Sti.COM.BR*

## Polymer-Based Technology

21–26 May 2000  
9<sup>th</sup> International Conference on Polymer-Based Technology (POC'2000), Tianjin, China.  
*Prof. Zhang Zhengpu, Institute of Polymer Chemistry Nankai University, 94 Weijin Road, Tianjin 300071, China*  
*Tel.: +86 22 2350 1386*  
*Fax: +86 22 2350 4853*  
*E-mail: zhangzp@sun.nankai.edu.cn*

## Flow Analysis

25–29 June 2000  
8<sup>th</sup> International Conference on Flow Analysis, Warsaw, Poland.  
*Prof. Marek Trojanowicz, Department of Chemistry, University of Warsaw, Pasteura 1, 02-093 Warsaw, Poland.*  
*Tel/Fax: +48 22 822 35 32*  
*E-mail: trojan@chem.uw.edu.pl*

## Chemical Sensors

25–29 June 2000  
EUROSENSORS XIV & International Meeting on Chemical Sensors VIII (ES-IMCS'2000), St. Petersburg, Russia.  
*Prof. Yuri Vlasov, Chairman*  
*Dr. Andrey Legin, Secretary*  
*St. Petersburg University, Universitetskaya nab. 7/9, St. Petersburg, 199034, Russia.*  
*Tel./Fax: +7 812 328 28 35*  
*E-mail: andrew@sensor.chem.lgu.spb.su*

## Organic Synthesis

1–5 July 2000  
13<sup>th</sup> International Conference on Organic Synthesis (ICOS-13), Warsaw, Poland.  
*Prof. M. Makosza, Institute of Organic Chemistry, Kasprzaka 44, 01-224 Warsaw 42, PO Box 58, Poland.*  
*Tel.: +48 22 631 8788*  
*Fax: +48 22 632 6681*  
*E-mail: icho-s@ichf.edu.pl*

## Macromolecules

9–14 July 2000  
38<sup>th</sup> International Symposium on Macromolecules (MACRO 2000), Warsaw/Lodz, Poland.  
*Prof. Stanislaw Penczek, Polish Academy of Sciences, ul. Sienkiewicza 112, 90363 Lodz, Poland.*  
*Tel.: +48 42 81 9815*  
*Fax: +48 42 684 7126*  
*E-mail: spenczek@bilbo.cbmm.lodz.pl*

## Coordination Chemistry

9–14 July 2000  
34<sup>th</sup> International Conference on Coordination Chemistry (34-ICCC), Edinburgh, Scotland.  
*Prof. P. Tasker, Chairman*  
*Dr. John F. Gibson, Secretary*  
*The Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.*  
*Tel.: +44 171 440 3321*  
*Fax: +44 171 734 1227*  
*E-mail: gibsonj@rsc.org*

## Visas

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

## Polymers in Medicine

17–20 July 2000

40<sup>th</sup> Microsymposium Polymers in Medicine, Prague, Czech Republic.

*Dr. Jaromir Lukas, Institute of Macromolecular Chemistry, Academy of Science of the Czech Republic, Heyrovskeho nam. 2, 162 06 Praha 6, Czech Republic.*  
*Tel.: +420 2360341*  
*Fax: +420 2367981*  
*E-mail: sympo@imc.cas.cz*

## Photochemistry

22–27 July 2000

18<sup>th</sup> IUPAC Symposium on Photochemistry, "Photochemistry into the New Century", Dresden, Germany.

*Prof. Dr. Silvia E. Braslavsky, Max-Planck Institut fuer Strahlenchemie, Postfach 101365, D-45413 Muelheim an der Ruhr, Germany.*  
*Tel: +49 (208) 306 3681*  
*Fax: +49 (208) 306 3951*  
*E-mail: braslavskys@mpi-muelheim.mpg.de*

## Solubility Phenomena

25–28 July 2000

9<sup>th</sup> International Symposium on Solubility Phenomena (9<sup>th</sup> ISSP), Hammamet, Tunisia.

*Prof. Najia Kbir-Ariguib, National Institute for Scientific and Technical Research, P.O. Box 95, Hammam-Lif, 2050 Tunisia.*  
*Tel: +216 1 430 215*  
*Fax: +216 1 430 934*  
*E-mail: ariguib@planet.tn*

## Chemical Thermodynamics

6–11 August 2000

16<sup>th</sup> IUPAC Conference on Chemical Thermodynamics, Halifax, Nova Scotia, Canada.

*Prof. M. A. White, Department of Chemistry, Dalhousie University, Halifax, Nova Scotia B3H 4J3, Canada.*  
*Tel.: +1 902 494 3894*  
*Fax: +1 902 494 1310*  
*E-mail: Mary.Anne.White@DAL.CA*

## Thermal Analysis and Calorimetry

14–18 August 2000

12<sup>th</sup> International Congress on Thermal Analysis and Calorimetry, Copenhagen, Denmark.

*Dr. O. Toft Sorensen, Materials Research Department Riso National Laboratory DK-4000, Roskilde, Denmark.*  
*Tel: +45 4677 5800*  
*Fax: +45 4677 5758*  
*E-mail: o.toft.sorensen@risoe.dk*

## Biotechnology

3–8 September 2000

11<sup>th</sup> International Biotechnology Symposium, Berlin, Germany.

*Prof. G. Kreysa, DECHEMA e.V.—c/o 11<sup>th</sup> IBS, Theodor-Heuss-Allee 25, 60486 Frankfurt/Main, Germany.*  
*Tel.: +49 69 7564 241*  
*Fax: +49 69 7564 201*  
*E-mail: info@dechema.de*

## Natural Products

4–8 September 2000

22<sup>nd</sup> International Symposium on the Chemistry of Natural Products, Sao Paulo, Brazil.

*Dr. M. Fátima das G.F. da Silva, Universidade Federal de Sao Carlos, Depto. de Quimica, Via Washington Luiz, km 235, CP676, Sao Carlos, Sao Paulo, Brazil.*  
*Tel.: +55 16 274 8208*  
*Fax: +55 16 274 8350*  
*E-mail: dmfs@power.ufscar.br*

## Trace Elements in Food

9–11 October 2000

Warsaw, Poland.

*Prof. B. Szteke, Chairman*  
*Dr. R. Jedrzejczak, Secretary*  
*Institute of Agricultural and Food Biotechnology*  
*ul. Rakowiecka 36*  
*02-532 Warsaw, Poland*  
*Tel.: +48 22 606 3876*  
*Fax: +48 22 4904 28*  
*E-mail: jedrzejczak@ibprs.waw.pl*

## Food Packaging

8–10 November 2000

2<sup>nd</sup> International Symposium on Food Packaging—Ensuring the Safety and Quality Food, Vienna, Austria.

*Dr. L. Contor, ILSI Europe, 83, Avenue E. Mounier, Box 6, B-1200, Brussels, Belgium.*  
*Tel.: +32 (2) 771 0014*  
*Fax: +32 (2) 762 0044*  
*E-mail: laura@ilsieurope.be*

**CHEMRAWN XIV** **NEW**

!! to be scheduled !!  
World Conference on Green Chemistry—Toward Environmentally Benign Processes and Products, Boulder, Colorado, USA.

*Dr. Dennis L. Hjeresen, Environmental Management Program, Los Alamos National Laboratory - Mail Stop J591, Los Alamos, NM 87545.*

*Tel.: +1 505 665 7251*

*Fax: +1 505 665 8118*

*E-mail: dennish@lanl.gov*

**IUPAC General Assembly/ Congress** **NEW**

!! to be confirmed !!

29 June–7 July 2001

Brisbane, Australia.

*IUPAC Secretariat*

*Tel.: +1 919 485 8700*

*Fax: +1 919 485 8706*

*E-mail: secretariat@iupac.org*

**Phosphorus Chemistry** **NEW**

29 July–3 August 2001

15th International Conference on Phosphorus Chemistry, Sendai, Japan.

*Prof. Masaaki Yoshifuji, Department of Chemistry, Graduate School of Science, Tohoku University, Aoba, Sendai 980-8578, Japan.*

*Tel.: +81 22 217 6558*

*Fax: +81 22 217 6562*

*E-mail:*

*yoshifj@mail.cc.tohoku.ac.jp*

**Analytical Sciences** **NEW**

6–10 August 2001

International Congress on Analytical Sciences 2001 (ICAS2001), Tokyo, Japan.

*Prof. Tsuguo Sawada, Chairman, Department of Applied Chemistry, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan.*

*Tel.: +81 3 5841 7236 (or 7237)*

*Fax: +81 3 5841 6037*

*E-mail: icas2001@laser.t.u-tokyo.ac.jp*

**Biodiversity** **NEW**

3–8 November 2001

3rd IUPAC International Conference on Biodiversity (ICOB-3), Antalya, Turkey.

*Prof. B. Sener, Department of Pharmacognosy, Faculty of Pharmacy, Gazi University, P.O. Box 143 06572, Maltepe-Ankara, Turkey.*

*Tel.: +90 312 212 2267*

*Fax: +90 312 213 3921*

*E-mail: blgsener@tr-net.net.tr*

**Strip in Thieme awards.**