President's Report on the State of the Union

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

1. 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 the 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 have 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 material 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, environment, 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 promotion of the chemical sciences globally. 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 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 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.

2. 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 ICSU, the International Council for Science. To further its mission, IUPAC has established a set of ten long-range Goals:

1. IUPAC will serve as a scientific, international, nongovernmental 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.

3. 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 Material 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.

4. 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 Bylaw 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 Division's 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.

5. 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 37th 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 65th 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 37th 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 38th 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 *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.

6. 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*, 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 IUTOX and 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 21st 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*, 2nd edition; and *Compendium of Analytical Nomenclature (definitive rules 1997)*, 3rd 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.

7. 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 phtyogenic 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 on "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* devoted to the topic of "Oil-Spill Countermeasure Technologies and Response Methods" appeared in the January 1999 issue. 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.

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.

8. 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 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 UK, 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.

9. 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 IOCD and partly funded by an ICSU grant to IUPAC. A CHEMRAWN Conference on

Green Chemistry is planned for 2000.

The theme of the 15th 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.

10. 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 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 members 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.

11. 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 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 Quimicos 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 Quimica, 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;
- 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 "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 21st century.

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