Chemical Education in Eritrea

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Introduction

Novel marine natural products are being found in pristine reefs along 1 100 km of Red Sea Coast in the Horn of Africa. Traditional healers talk of herbs and plants they have used for generations for medicinal purposes. In Eritrea, one of the world's newest countries, chemists and educators are probing structures, learning from oral history, and equipping young people to understand and shape the opportunities presented by new and existing chemical processes. Eritrean chemical education is coming into its own in the new millennium, mirroring the emergence of the fledgling nation from European colonialism and Ethiopian annexation to independence in 1993. Thirty years of war with neighboring Ethiopia before independence, and a renewed conflict in the past two years, have left urgent infrastructure and development needs. Providing highly qualified human resources to address those needs and create new opportunities is high on the national agenda.

For science education, this situation requires a concerted effort to enhance the quality of teaching and research, and to ensure that students are equipped to produce knowledge-intensive goods and services to meet immediate local needs, and to set attainable long-term goals. Chemistry plays a central role in many of those basic human needs. Clean air, water, health care, food supply, environment, agricultural products and practices, pharmaceutical compounds, ceramics, and building materials all have a critical chemical dimension, and all require secondary school, technical school, public health, and university graduates with sound backgrounds in basic chemistry and creative problem-solving abilities.

A snapshot of Eritrean chemical education activities at the turn of the millennium reveals the following:

- Secondary school teachers draft papers on how to improve methodology in teaching chemistry and attend workshops on how to introduce practical work and molecular models into the classroom.
- A curriculum development team prepares secondary school chemistry textbooks that weave discussions of the chemical principles used by local industries such as the Massawa Salt Processing Plant, Eritrean Cement Factory, Denden Glassworks, Gejeret Silicate and Carton Factory, and the Eritrea Match and Candle Factory into grades 10 and 11 chemistry textbooks.
- An ambitious, interdisciplinary team, led by University of Asmara chemists, collects and identifies Eritrean medicinal plants, to learn which parts of the plants are used by traditional healers, and for what diseases. They then isolate and characterize the active components, with the assistance of selective bioassays. The team includes experts in chemistry, microbiology, botany, and pharmacology, and has received some support from UNESCO. This research effort is linked with the chemical education of university undergraduates. Several undergraduate chemistry and biology students have made significant contributions to the project through senior-year research projects.

Some members of the Eritrean Medicinal Plants Team. From left: Dr. Wezenet Tewodros (Microbiology), Dr. Azieb Ogbaghebriel (Pharmacology), Dr. Gehebrehiwet Medhanie (Botany), and Team Leader, Dr. Berhane Girmay (Chemistry).

A medicinal plants team has recently characterized the properties of Eritrean pumpkin (cucurbita pepo L) seed and the fatty acid composition of the seed oil.
Y. M. H. Younis, *et al. Phytochemistry*, 54, 71–75 (2000).

- The Eritrean Chemical Society, comprising about 160 members from industry, government, and education, meets regularly for professional development, research conferences, to popularize chemistry in schools, and to promote chemistry education and research.
- Partners from the Ministry of Education, University of Asmara, and local schools wrestle with assessment issues—they seek ways to address low passing rates for secondary school certificate examinations and high dropout rates among first-year university science students.
- External partners, such as the Italian and Swedish governments, contribute meaningfully to science and technical education with infrastructure and exchange programs.

Roots of Eritrean Science Education

The earliest forms of traditional education were informal, with the family being the earliest agent of socialization. In addition to learning tasks of cooking, brewing, and working the land, children were taught the art of telling folk stories and proverbs. Present knowledge about Eritrean medicinal plants attests to the value and strength of that oral tradition.

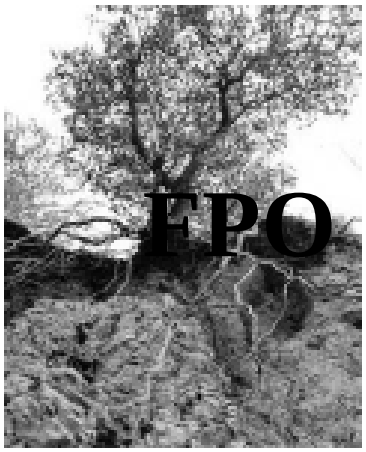
The church and mosque planted the seeds of formal education in Eritrea, where goals to train priests for the church and read the Koran and memorize the Surah were met in part through instruction in reading and writing Geez (church) and Arabic (mosque). The study of plants and herbs may have been a part of the early curriculum. Inks were compounded from herbs and charcoal, and "shebti" (*phytolacca dodecandra*) was regularly used for washing long before the introduction of commercial soaps. Swedish Evangelical and Catholic missions fertilized those early seeds by introducing practical subjects in the languages of Tigre, Tigrinya, Kunama, and Arabic.

Formal science education emerged from the flux of five administrative periods in Eritrean history. Figure 1 shows the growth of schools, teachers, and students for those five periods.

Under Italian Colonialization (1890–1941), the curriculum was expanded to include history, geography, language, hygiene, arts, and crafts. One purpose of education was "to indoctrinate Eritreans with a devotion for Italy and a respect for Italian culture and civilization". Schools were to assist Eritreans to become "worthy elements of the native troops, interpreters, clerks, telephone operators, and typists". The Eritrean child was to be a "conscious propagandist of Italian civilization and so proselytize his parents". Languages of instruction were Italian and the dominant languages of Tigrinya, Tigre, and Arabic.

Despite the legacy of indoctrination, solid educational programs in this period prepared the way for formal instruction in chemistry and other sciences. Schools were constructed, primary education was offered, basic equipment and chemical reagents were obtained, and important industries producing soap and beer were founded. The period leading up to and during the Italian invasion of Ethiopia saw rapid expansion in education, and the incorporation of Tigray into Eritrea led to the opening of new schools in that region.

The British Military Administration (1941–1952) took over responsibility for schools after the British invasion and defeat of Italian East Africa. Tigray province went back to Ethiopian administration, along with the new Tigray schools. The main goals of the British educational structure were to force Eritreans into a wage economy and to break up tribal solidarity. Instruction was initially in the dominant



The Eritrean "kellau" plant. Extracts from the bark of the root show promising antibacterial and antifungal properties.

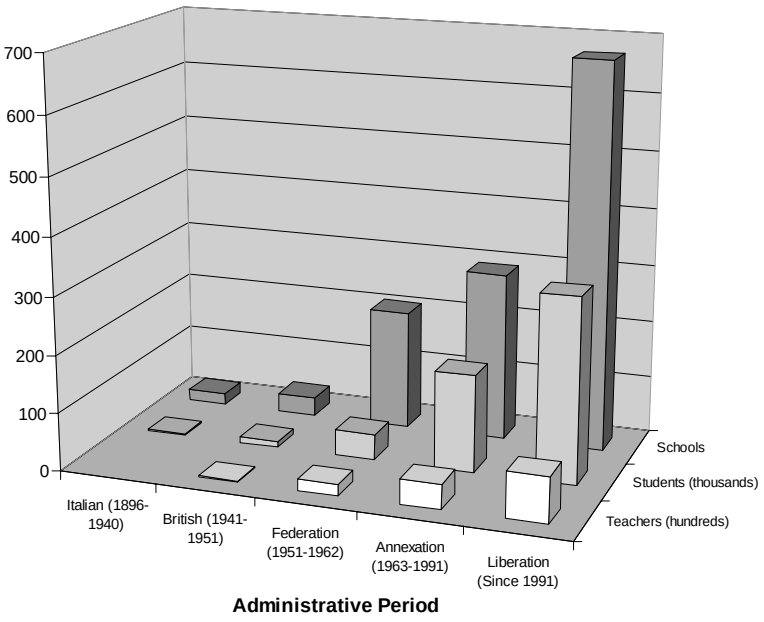


Fig. 1 Educational growth in Eritrea.

Eritrean language—Tigrinya for Christians and Arabic for Muslims. The first ministry of education was created in 1942, the first teacher training in college in 1946, and teachers were recruited from graduates of the former Italian school. Elementary and middle school students studied mathematics and science.

Under the period of Federation of Eritrea with Ethiopia (1952–1962), the first secondary schools were opened, and education was given increased priority, with distinctive influences of the Ethiopian government being evident. Secondary students now studied chemistry, as well as anatomy, biology, and physiology. The Barka Secondary School in Asmara still uses facilities, equipment, the chemistry laboratory, and even some reagents first supplied by the Camboni Fathers. The University of Asmara was officially established on 20 December 1958 by the Missionary Congregation Pie Madri della Nigrizia of Verona, Italy. Courses were in Italian, to prepare students for the final year of study in an Italian University to earn the "Laurea".

After Eritrean "Annexation" to Ethiopia in 1962, Amharic became the language of instruction in Eritrean schools, replacing Tigrinya and Arabic. The number of primary and secondary schools increased to over 200, and secondary schools were opened in every district capital. Despite the rapid growth in schools, accessibility to education was limited. In 1988, only 20% of the school-age population of Ethiopia, which included Eritrea at the time, were in school.

Following Independence in 1991, the emerging nation of Eritrea gave high priority to education, so that by 1998, more than 375 000 students, or 40% of the school-age population, were enrolled in 726 schools.

Present State of Eritrean Chemical Education[1]

Elementary, Secondary, and Technical Schools

Eritrean students receive their first introduction to chemistry in elementary school general science, taught in grades 6 and 7. Formal coursework in chemistry begins in secondary school grade 8, and continues each year through grade 11. Students who are educated in technical schools receive the same grades 10 and 11 chemistry curriculum as secondary school students. Students are assessed through the Eritrean Secondary Education Certificate Examination (ESECE) in chemistry and other subjects at the end of grade 11. A 1997 survey tallied about 100 chemistry teachers in 29 secondary schools.

Chemistry teachers are a mix of Eritrean nationals, many educated at the University of Asmara, and visiting teachers, many from India. The vast majority of those teachers are well qualified, with a bachelors or masters degree. Most face challenging teaching conditions. Student/teacher ratios are high, typically about 40, and class sizes of 60 are not uncommon. Average weekly teaching loads are just over 30 hours per week. Because of the shortage of schools, most schools run two sessions each day for students, with one group studying in the morning, and one in the afternoon. As a temporary measure, owing to disruptions in the school year caused by the recent conflict with Ethiopia, most secondary schools now operate six days a week. Textbooks are often in limited supply; practical work is not routinely part of the secondary school curriculum; and chemicals, equipment, lab manuals, models, and technical support are all hard to come by for many schools. The Asmara Barka school, for example, runs about 60 sections of chemistry classes each week, with about 60 students in each section—using the single laboratory built by the Camboni Fathers for demonstration purposes.

Yet, despite those challenging conditions, teachers are working hard and constructively with the Ministry of Education and the University of Asmara to take steps to strengthen chemical education. A chemistry panel of the Ministry's Curriculum Research and Development Center has produced Eritrean textbooks for grades 8–11, which present standard chemistry curriculum, while placing concepts in the context of local industrial processes.

While further revision is necessary to make the texts more student-friendly, these materials represent unique examples of adapting chemistry curriculum to the local environment.

Recently, secondary school chemistry teachers set as one of their highest priorities the systematic introduction of practical work, learning by doing—through experiments, demonstrations, and field trips. And so they exchange ideas. They hope to make teaching more student-centered, and to make students more active learners. And they are finding creative ways to overcome barriers. Zinc metal can be harvested from old dry cells. Aluminum can be retrieved from cigarette and gum foils. Students can collect silica gel from shoe shops and sulfur from local markets. Students can conduct many simple experiments at home[2]. Other chemistry teachers are systematically evaluating methodology used in current chemical education practices, for presentation at an annual research conference of the Eritrean Chemical Society[3].

Chemistry at the University of Asmara

The University of Asmara received its charter from the Ethiopian government in 1968. It granted its first undergraduate degrees in chemistry in 1980, shortly after a troubling period in the institution's history, when the university was closed after the Communist revolution in Ethiopia. The early 1980s saw major growth for chemistry and other science programs, as young, influential scholars, many from India, East Germany, and elsewhere, contributed to building the institution. The 1983–1984 University catalog shows a sample program for chemistry students, taking coursework in all four main branches of chemistry, along with other required courses, such as Marxist thought and practice. Some chemical education debates change little over time, as noted by the calendar rule that: "Calculating machines may not be used during examinations unless permitted or required by the course instructor"[4].

Since independence, the University has grown explosively, to its present student population of over 4 000—in a campus originally designed to accommodate about 500. Undergraduate programs in chemistry continue to receive high priority, boosted by major linkages with Swedish institutions such as the University of Uppsala and Stockholm University. Interdisciplinary research programs rooted in chemistry, such as the Eritrean Medicinal Plants Project and the Materials Science Project, which deals with structure–property relationships of technologically useful materials, are producing results and attracting attention. Those programs have had valuable spinoffs for chemical education, as they attract and retain gifted scholars with Ph.D. and postdoctoral qualifications, keep chemists working across interfaces with other disciplines, bring in research equipment, and involve senior undergraduate students in activities. The chemistry department is currently in the process of reviewing its undergraduate curriculum, looking at both content and pedagogy, and evaluating ways to introduce computer-assisted instruction and molecular modeling into the classroom effectively.

Eritrean Chemical Society

Eritrean chemists know the importance of building networks and lifelong learning, particularly when working in settings geographically separated from major global centers of excellence in chemistry. Immediately after independence, in November 1991, the Eritrean Chemical Society was founded in the capital city of Asmara. It was legally recognized by the government in 1993, and has been working actively since then to achieve the following objectives:

- to develop and promote chemistry education and research
- to establish close relationships between chemists and other professionals engaged in chemistry-related fields of activity so as to increase the role of chemistry in national development
- to popularize chemistry, especially in schools
- to enhance participation and collaboration of professional chemists in matters pertaining to national policies, curriculum development, and training of chemists
- to promote the improvement of the qualification of members
- to provide a forum for the exchange of ideas through professional publications, symposia, and regular meetings
- to establish and strengthen links with other societies, national and international, that pursue similar aims

Several of those key objectives have been translated into action. The society has about 160 members, from industry, government, and education. It sponsors annual research conferences that bring together local and international chemists, and it has held several significant workshops, where key stakeholders work to strengthen chemical education at the secondary level.

Acknowledgments

We would like to thank Mr. Habtai Zerai from the Department of History, University of Asmara, for contributing to and checking the historical section, and Dr. Ghebrebrhan Ogubazghi, Dean of the College of Science, University of Asmara, for providing other materials and support for this project.

[1]Historical background summarized from:

(a) Research provided by Mr. Habtai Zerai, University of Asmara History Department, September 2000.

(b) John Distefano and University of Asmara History Staff, in "Joint Survey on the State of High School Education in Eritrea. A Compilation of Papers Presented at a Workshop, February 1998", University of Asmara and Eritrean Ministry of Education, 1998, Dr. Ghebrebrhan Ogubazghi, Commission Chair.

(c) Asmara University General Catalog, 1983–84 Academic Year, Asmara, Ethiopia, January 1983.

[2]"Report on the Proceedings of the Workshop on Integration of Practical Activities Work in Teaching Chemistry in Eritrean Secondary Schools", Eritrean Chemical Society, December 1998.

[3]Ghebrehiwet Mehari, "Some Aspects of Methodology in the Teaching of Chemistry in Secondary Schools of Eritrea", Ministry of Education, Zoba Maekel, 1999.

[4]Reference 1(c), page 40.

Long-Range Research Initiative (LRI) of the American Chemistry Council

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Summary

In January 1999, the chemical industry committed over $100 million for a five-year period to sponsor health and environmental research related to chemical use. The Long-Range Research Initiative (LRI) is a visionary program of the American Chemistry Council designed to increase knowledge about the potential and actual effects of chemicals on the health of human and wildlife populations and on the environment. The objectives of the LRI are to conduct new research through prominent scientific institutions; develop new testing and screening tools to support risk assessment; and support informed decision-making by government, industry, and citizens. CIIT will conduct much of the LRI research in its areas of expertise—chemical carcinogenesis; endocrine, reproductive, and developmental toxicology; neurotoxicology; and respiratory toxicology.

Introduction

In January 1999, the Board of Directors of the American Chemistry Council approved the LRI, which committed over $100 million for the next five years to sponsor research on the health and environmental effects of chemical use. The LRI represents an expanded commitment to Responsible Care®, the industry's voluntary continuous improvement initiative in health, safety, and environmental performance. The American Chemistry Council research initiative builds on the foundation of and approach to research conducted at CIIT. Research supported by the LRI will advance knowledge about the health, safety, and environmental effects of products and processes. The LRI has a number of functions:

- identifying emerging health and environmental issues
- aligning industry research efforts with public priorities
- developing improved risk assessment methods to support informed regulatory policies
- participating in global processes to demonstrate that the chemical industry is a partner in solving health and environmental problems
- reducing uncertainty in risk assessment and improving risk-based decision-making
- reinforcing the industry commitment to openly providing information about chemicals and potential health and environmental effects
- establishing a leadership position through proactive research

Development of the Long-Range Research Initiative (LRI)

Members of the Chemical Manufacturers Association voted in June 2000 to change the name of the organization to the American Chemistry Council to reflect the significant business changes occurring in industry. Among these changes in industry are expanded commitments to research and testing; improved performance in environment, health, and safety; and innovations in outreach, dialogue, and advocacy. Within the last two years, the industry has demonstrated this commitment in several ways.

We have worked with the not-for-profit environmental advocacy organization Environmental Defense and the United States Environmental Protection Agency (U.S. EPA) to create a high-production-volume (HPV) testing program that will result in the

Table 1 Some of the strategic questions underlying the Long-Range Research Initiative (LRI).

Are children more susceptible to given chemical exposures and effects than adults,thereby necessitating greater chemical control measures?
What models or methods can be developed to assess human and environmental exposures to chemicals more accurately?
Which animal models or test methods are most relevant for predicting effects on human health from exposures to chemicals?
Are the high-dose effects seen in animal studies relevant to people who are exposed to low doses?
How do we incorporate new scientific advances into our understanding of the potential effects that chemicals may have on humans and the environment?
How do we reduce the scientific uncertainties that can lead to overly conservative regulations?
What risk assessment processes can be developed that would be more readily understood and trusted by the public?

investment of hundreds of millions of dollars to conduct screening tests and to make the resulting data fully available to the public. A similar program implemented by industry at the global level will go one step further and provide initial hazard assessments for 1 000 HPV chemicals by 2004. We have created the Long-Range Research Initiative (LRI), which strengthens industry's commitment to Responsible Care. We celebrated the 10-year anniversary of the award-winning Responsible Care initiative and made a commitment to continuous progress toward the vision of "no accidents, injuries, or harm to the environment." The industry has also expanded joint advocacy efforts with environmental groups on such issues as endocrine modulation.

The LRI is an expanded commitment drawing directly from Responsible Care that is designed to increase knowledge of the potential effects of chemicals on the health of human and wildlife populations and on the environment. LRI goals are to conduct research through CIIT and other prominent institutions; to develop new testing and screening tools to support risk assessment; and to support informed decision-making by government, industry, and citizens. For almost 25 years, 30–40 companies from the chemical industry have supported CIIT. Through the LRI, support for CIIT is being enhanced and consolidated into sponsorship by the entire membership of nearly 200 companies of the American Chemistry Council. Approximately 60% of funds from the LRI will be used to support the research at CIIT.

The LRI was developed from a pilot program called the State of the Science Study that was conducted in 1997 (described in "The Chemical Industry's Research Initiative and the State of the Science Study," *CIIT Activities*, 1–6 June 1998). Research priorities were identified in the State of the Science White Papers published in January 1998 by the Chemical Manufacturers Association (now the American Chemistry Council) and CIIT. This document was produced through a collaborative effort with scientists from government, academia, and industry. The strategic questions identified by these diverse collaborators underlie the LRI (Table 1). LRI

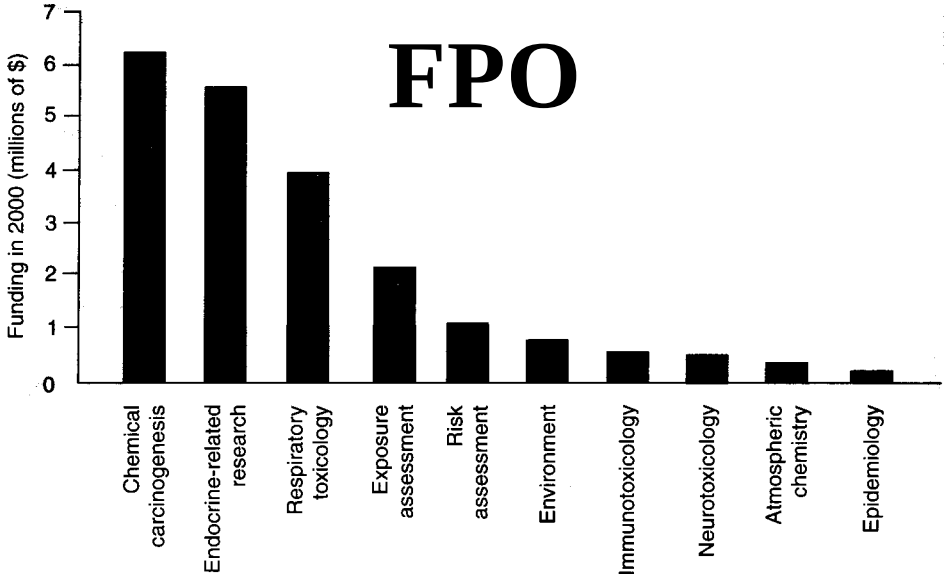

Fig. 1 Funding of the Long-Range Research Initiative (LRI) for fiscal year 2000 by scientific area.

Table 2 Technical implementation panels of the American Chemistry Council.

Technical Implementation Panel (TIP)	Focus
Atmospheric Chemistry TIP	Explores the role of chemicals in atmospheric science that will increase our understanding of the processes affecting formation, transport, and removal of pollutants in the atmosphere.
Chemical Carcinogenesis TIP	Examines the biological mechanisms and dose–response relationships involving cancers that may be associated with exposure to various substances. Extrapolation of results from animals to humans, the role of biomarkers, and gene-related differences in biological responses are among the issues explored.
Endocrine TIP	Considers the effect that exposure to chemicals might have on the endocrine, reproductive, and developmental health of human and wildlife populations.
Environmental TIP	Addresses research on issues of environmental exposure assessment, ecological risk assessment and management, and ecosystem dynamics.
Epidemiology TIP	Increases scientific understanding of the potential hazards of chemicals and improves epidemiological methods and their application in assessing human health risks.
Exposure Assessment TIP	Addresses research designed to characterize human exposure to chemicals and reduce the uncertainty for quantitative estimates of exposures associated with the potential human health effects of chemicals.
Immunotoxicology TIP	Sponsors research to develop animal models that predict the ability of chemicals to induce or exacerbate allergic and other immune responses.
Neurotoxicology TIP	Examines biologically significant changes in the structure or function of the nervous system that may result from chemical exposure.
Respiratory Toxicology TIP	Sponsors research to improve risk assessment methods of inhaled reactive gases, understand the pathobiology and dosimetry of particles and fibers, and improve animal models of particulate-induced disease.
Risk Assessment Methods TIP	Addresses research to advance human health risk assessment methodologies for chemicals.

funding for fiscal year 2000 by scientific area is shown in Fig. 1.

Technical Implementation Panels

The Technical Implementation Panels (TIPs) of the American Chemistry Council are organized to provide technical support and assistance for each of 10 scientific areas (Table 2). The TIPs consist of outside experts working in partnership with scientific specialists from member companies of the American Chemistry Council to support the Long-Range Research Initiative (LRI). CIIT derives support from the LRI for research in chemical carcinogenesis; endocrine, reproductive, and developmental toxicology; neurotoxicology; respiratory toxicology; and risk assessment methods. Other research organizations are supported through an extramural, competitive, request-for-proposals process that addresses scientific issues in endocrine modulation and reproductive and developmental toxicology, epidemiology, exposure, immunotoxicology, neurotoxicology, and risk assessment. Requests for proposals are posted on the American Chemistry Council Web site (http://www.americanchemistry.com) under the overview information on the LRI.

Operating Principles

The six research principles under which the Long-Range Research Initiative (LRI) operates reflect the commitment of industry to scientific excellence: (1) studies will complement existing research by government, academia, and others; (2) collaborations with key internal stakeholders, academia, and government are emphasized; (3) experts from academia, government, and industry will participate in decision-making and provide advice on the quality, direction, and value of the research conducted; (4) individual researchers will determine the methods and procedures to be used in conducting the research; (5) rigorous scientific principles and laboratory practices will be used at all times; and (6) results will be made public regardless of outcome.

The global LRI is coordinated through the Long-Range Research Initiative Steering Committee of the International Council of Chemical Associations (ICCA). The United States chemical industry is represented at ICCA through the American Chemistry Council, the European chemical industry through the European Chemical Industry Council (CEFIC), and the Japanese chemical industry through the Japan Chemical Industry Association (JCIA). Each organization has the responsibility for implementing ICCA principles, which address scientific excellence, open processes and results, fair and unbiased conduct, and relevance to the chemical industry.

Selected Examples of Ongoing Projects

An overview of studies being conducted as part of the Long-Range Research Initiative (LRI) illustrates the depth and breadth of industry efforts (Table 3). Some studies involve species extrapolation issues, such as the chloroform studies conducted at CIIT. CIIT research on the mechanism of chloroform toxicity was extremely valuable in assessing the risk to human health from low-level environmental exposures to chloroform. The examples presented below

Table 3 Selected highlights of projects funded by the Long-Range Research Initiative as of June 2000.

Project	Objective	Outcome	Status
Chemical carcinogenesis: Study the potential health effects of trace amounts of chloroform in drinking water.	Determine the mechanism of action for liver tumor formation.	Results showed that tumor formation in test animals is not relevant to chloroform risk assessment.	The U.S.Environmental Protection Agency has revised its risk assessment of chloroform.
Endocrine, reproductive, and developmental toxicity: Develop models for representative species and determine whether they act as an indication for endocrine-active materials.	Determine how the findings involving the response of one species apply to humans and other animals.	Studies are in progress.	Three projects are under way.
Environmental research: Evaluate habitat use to improve exposure assessment and evaluate emission rates for ambient exposure levels.	Collect data to validate existing or new habitat evaluation methods.	Studies are in progress.	Two projects are under way.
Epidemiology	Examine mortality of 1 million chemical workers.	Information on long-term health effects was obtained.	This project has been completed. Peer review is under way.
Exposure modeling research: Address the limitations of existing models used to predict the occurrence of human exposure through various pathways.	Establish better exposure model for high-production-volume and other chemicals for which there will be health effects data.	Studies are in progress.	Three projects are under way.
Immunotoxicology: Develop animal models that predict the ability of chemical allergens to induce or exacerbate reactions in the respiratory tract.	Examine different measurements in rodents exposed to known respiratory allergens to determine the most accurate predictors of whether a chemical is capable of acting as a respiratory allergen.	Studies are in progress.	Three studies have been sponsored, two by the American Chemistry Council and one by the European Chemical Industry Council.
Respiratory toxicology: Study dosimetry and risk assessment issues for inhaled gases.	Develop, refine, and expand computational biological models for the upper respiratory tract.	Studies are in progress.	Collaboration is under way with U.S. EPA scientists to refine inhalation reference concentration (RfC)methodology.
Risk assessment methods: Study the effects of interindividual differences in human nasal anatomy on respiratory airflow and inhaled gas uptake.	Simulate airflow and regional gas uptake in nasal passages.	Studies are in progress.	There is the potential for the development of several new human computational fluid dynamics models based on different nasal anatomies.

describe research supported by the LRI at CIIT as well as at other research organizations.

Alternative Bioassays

Shortcuts or replacements for long-term bioassays used to determine the potential hazards of chemicals are being sought throughout the scientific community. These alternative bioassays are needed to save time and resources and reduce the number of animals used in toxicity testing. One of these new technologies, the p53 transgenic animal mouse model, may reduce the time to detection of tumors following chemical treatment. Before the p53 model can be used in risk assessments, however, the data from the model must be understood and interpreted. CIIT is conducting research to determine the relevance of the p53 model in predicting human health outcomes. Current CIIT projects involve the investigation of the carcinogenicity of benzene and the drinking water by-product bromodichloromethane.

Atmospheric Chemistry

Research in the atmospheric sciences sponsored by the LRI is intended to fill knowledge gaps and aid in the development of future environmental policies. The priority research themes include atmospheric

degradation pathways, aerosol microphysics and chemistry, and organic compounds in the global atmosphere. For example, a project on the contribution of biogenic emissions to urban ozone leverages an existing research program of the Coordinating Research Council, a nonprofit organization that directs engineering and environmental studies on the interaction between automotive equipment and petroleum products.

Epidemiology Studies

The chemical industry has historically conducted many epidemiology studies to determine long-term mortality and cancer incidence in workers involved in the manufacture of chemical products. The American Chemistry Council has developed an inventory of mortality and cancer incidence studies available in the peer-reviewed literature. This worker population database is a valuable resource for the chemical industry and for the scientific community at large. The Health Studies Inventory Summary Report is available on the American Chemistry Council web site (http://www.americanchemistry.com), and the database itself can be purchased by both Council members and nonmembers. The inventory was used for an interpretive review to assess the overall burden of disease for the population of chemical manufacturing workers.

Exposure Research

A critical issue for the chemical industry is in the area of exposure. As the high-production-volume (HPV) testing program is developed and implemented and large amounts of chemical, animal, and hazard toxicity data are generated, exposure data and models to predict patterns of exposure will be needed to understand better the potential hazards associated with HPV chemicals. Research is in progress to examine the limitations of existing models used to predict the occurrence and extent of human exposure. For example, the Exposure Assessment TIP is sponsoring research to examine models that predict chemical exposures from oral and dermal absorption as well as models that focus on an individual's personal environment, or microenvironment. The Exposure Assessment TIP will also oversee projects aimed at understanding and developing a framework that focuses on combinations of exposure pathways and sources and the accumulation of these exposures over time. Exposure modeling is expected to lead to better exposure assessment for chemicals. Work on the exposure framework will help companies understand how a person's exposure is influenced by activity patterns, age, gender, occupation, and other demographic factors.

Risk Assessment

The LRI is funding projects that address methods in risk assessment. One of these projects involved assessment of the human health risks from formaldehyde using benchmark dose analysis. The significance of the project was recognized in 1999 when CIIT scientist Dr. Paul Schlosser received an award from the Risk Assessment Specialty Section of the Society of Toxicology for his poster presentation on "Formaldehyde Risk Assessment by Benchmark Dose Analysis Using DNA-Protein Cross-Links as an Internal Dose Metric." Other research projects address pharmacokinetic modeling, cumulative risks, inter- and intraspecies variability in extrapolation modeling, and low-dose extrapolation modeling.

Wildlife Studies

The LRI is sponsoring research involving wildlife studies to develop animal models for detecting endocrine-active materials. Field studies of songbird reproduction and productivity are under way, and research is being conducted on fence lizards as a potential reptilian model for ecological assessment of endocrine-active materials.

Conclusions

Environmental regulation and product stewardship have been very effective in the last 20 years at reducing exposures to manufactured chemicals. Through Responsible Care, workers in the chemical industry are 4.5 times safer than those in all other manufacturing industries (calculated from tables in the *Monthly Labor Review*, July 2000). The chemical industry has also reduced EPA Toxic Release Inventory emissions between 1988 and 1998 by 63% while increasing production over 27% and is talking with its neighbors through some 300 Community Advisory Panels.

To understand the impact of chemicals on human health and the environment, the chemical industry and downstream chemical users are engaged in providing more information to improve understanding of how chemicals are manufactured, used, distributed, and ultimately disposed of. What are the potential effects on the environment or on human health associated with low-level exposures to chemicals? How can the scientific issues associated with sustainability and life-cycle analysis be identified and developed? Such questions can only be answered by effectively working with research communities in academia, government, and industry. In alliance with CIIT, the Long-Range Research Initiative (LRI) is actively engaged in improving our understanding about chemicals and finding answers to these questions.

Chemistry in Egypt

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Practical Chemistry by Micro-Methods

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CAMBRIDGE:
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Introduction

Chemistry has been practiced in Egypt since the time of the Pharaohs. Then, the practice of chemistry was limited to priests and aimed at serving kings and rulers of the country. The practice of chemistry on a broader scale and the teaching of chemistry in Egypt are relatively recent phenomena.

Increased national chemical activities began by the end of the 19th century with the establishment of several governmental laboratories for chemical analysis and quality control of raw materials, water, industrial products, and several other imported or locally produced items. Such laboratories served governments and decision-makers by helping to regulate and enforce the import, export, and safe use of items.

Chemical Education in Egypt

Higher education in Egypt began effectively in the early 20th century with the establishment in 1908 of the first university at Cairo, the Egyptian University, which was nongovernmental and was concerned mainly with arts. By 1925, the first governmental university, Cairo University, was founded. It replaced the Egyptian University and had faculties for arts, sciences, medicine, pharmacy, law, and other disciplines.

The chemistry department of the Faculty of Science at Cairo University was established according to the highest international standards. Teaching methods practiced there have stemmed from the pioneering achievements of the Leibig Teaching Laboratory in Germany during the late 19th century. Prof. Schonberg from Germany was the head of the chemistry department at Cairo University until the mid-1950s. It is noteworthy that the implementation of micro-methods in teaching chemistry, which seemingly is thought to be a modern invention (or, rather, reinvention) was fully established in Cairo at the time of the foundation of the chemistry department about 1924. This fact is well documented in a book by Prof. Egerton C. Grey, who was then a professor of chemistry at the Government Medical School in Cairo. The preface of his book (*Practical Chemistry by Micro-Methods*, W. Heffer & Sons, Ltd., Cambridge, England, 1925) advocates widespread teaching of elementary physical chemistry, qualitative analysis, volumetric analysis, and organic chemistry using micro-methods.

The second university in Egypt was founded at Alexandria in 1942. The chemistry department of Alexandria University was established on the basis of a strong link with high-level international institutes. Prof. Flaschentrager from Germany was Professor of Biochemistry at Alexandria University from the mid-1940s until the late 1950s. The 1999 Nobel Prize winner in chemistry, Prof. Dr. Ahmed Zewail, was a graduate of the Alexandria University Chemistry Department, and he was also awarded his M.Sc. degree at this university.

Dr. Ahmed Zewail, Egyptian Nobel Prize Laureate for Chemistry, 1999

Ain-Shams University was established in 1950. Prof. Mostafa El Sayed, the nanostructured systems pioneer and another possible Nobel Prize candidate, is a graduate. Assuit University (1957),

Preface from *Practical Chemistry by Micro-Methods*

It must be evident to many that the time has come for a change in some of the methods of teaching practical chemistry. Classes seem to get larger every year, and the standard is being gradually raised. Much which was done in the first year of a university course must be pushed into the school's curriculum. It follows that many experiments which could once be performed by each individual must perforce be omitted, and there is a tendency to meet the situation by adapting the practical course rather to the convenience of the laboratory than to the individual needs of the students. The majority who come to the chemical department today, are applying themselves to the science as a means and not as an end, seeing how divergent these ends are, it is a pity that the training must so often be the same. At the best this is but a compromise.

Organic chemistry, particularly, is neglected because of the expense of many reagents and the danger of working with large quantities of inflammable materials.

The method of practical microchemistry is that of working with minute quantities of material, specks of solids, drops of liquids. With this method the difficulties which would hamper many a laboratory will be found to vanish. A student, for example, may without danger prepare a few ccs. of the gases, however inflammable or explosive, and he can study the properties of much solvents as school, ether, chloroform or benzene by the use of drops without danger to himself or anxiety to his teacher.

There is nothing which at present is done by students with large apparatus that cannot be done with the micro-method, but there is much that can be done with small apparatus that is sheer waste when done on the larger scale.

With small reagent bottles and small apparatus the benches and general equipment of the laboratory may be greatly simplified. Everything is easier to find and to handle. A student's whole outfit may be put upon a tea-tray, and with his laboratory thus all at hand the student may sit down to his work with consequent sparing of fatigue to himself and to his teacher. The class room whatever the stage of the work, becomes a place of peace and quiet, and the foul atmosphere so often the result of work on a large scale, is avoided. This means a great gain from the point of view of the student's health, a matter which in science teaching is often sadly neglected.

The methods of micro chemistry are exceedingly rapid, for example, by the use of the table on page 65, one of my staff was able to identify the bases of fifteen unknown simple salts in ten minutes with only one doubtful case. This, I think, must be a record.

Such rapid work is the result of using drops, and employing one glass slide instead of several test tubes. Several reactions may be viewed simultaneously, and by the aid of a pocket lens, studied with a care which is not possible with the test-tube.

One drop of a solution divided into three parts suffices in many cases to characterise at once an unknown base. After the reaction the slide is washed and dried in a second and ready for the next test.

With this sparing of time it follows that much more work can be got into the working hours, and in consequence studies which were once spread over many years may be condensed into a few. The economy also in energy and in expense is enormous, with the result that it is possible to cover a much broader field of study.

This book is intended for schools or for the earlier part of a university course, and it covers the practical work required by the conjoint boards of the Royal Colleges of physicians and surgeons. While describing the methods of micro chemistry, it indicates also how a practical course may be broadened to include exercise, in elementary physical chemistry, qualitative analysis, volumetric analysis, and a brief introduction to organic chemistry is given. Sufficient to give the student a taste for this fascinating subjects.

I would like, in concluding to express my thanks to my colleagues, Mr. W. M. Colles, for his valuable help.

The Author wishes to thank Messrs. Baird & Tatlock for so kindly providing the blocks for the illustrations.

EGERTON CHARLES GREY
CAIRO, 1924

as well as several regional universities at Mansoura and Tanta (1969), at Zagazig and Menia (1974), and others, were founded during a period of rapid expansion of chemistry education in Egypt. By 1964, Al Azhar University also had a Faculty of Science. At present, the 13 governmental universities in Egypt have about 2 million students. About 30% of university students are enrolled in chemistry courses.

In addition to the governmental universities, there are the American University in Cairo and two recently established private universities at Sixth of October City near Cairo. The necessity for new universities is dictated by increasing population and the resulting overcrowding in existing universities, a situation that usually has a negative effect on the quality of higher education.

Chemistry instruction takes place in several faculties. Chemistry departments deal mainly with basic chemistry and its applications. In faculties of medicine and veterinary medicine, teaching focuses on biochemistry and vital biochemical processes. Pharmaceutical chemistry departments teach chemistry of drugs and pharmaceuticals. Chemical engineering is given in faculties of engineering. Soil chemistry, pesticide chemistry, and food chemistry are principal disciplines in faculties of agriculture.

Chemistry departments are provided with labo-

Cost-effective appliances for educative small-scale school chemistry experimentation. Courtesy M. K. El-Marsafy, S. Abdel-Moezz, and F. Ebeid, Chemistry Department, Faculty of Education, Ain Shams University, Roxy Cairo, Egypt.

ratories for practical chemical education and with libraries that contain relevant periodicals and scientific books. Information technology is now being introduced in all phases of teaching to enhance students' educational resources through information and research networks. Distance learning has recently been introduced in Egypt through the Nile Sat Television System, which covers all educational stages.

The Egyptian Chemical Society

The Egyptian Chemical Society (ECS) was established in 1928 and is a member of the Society of Arab Chemists. It strives to foster chemical research connections among chemists and chemical engineers locally and regionally. It also encourages cooperation in the exchange of knowledge and ideas. The ECS publishes the *Egyptian Journal of Chemistry*, which appears bimonthly and features original research in different fields of pure and applied chemistry. The ECS sponsors the Egyptian Chemical Conference, which is held regularly every three years and covers different fields of chemistry. The society gives support to young chemists through effective cultural and scientific programs that include lectures, meetings, seminars, and scientific visits covering various aspects of chemistry and chemical industry.

One of the main objectives of the ECS is to raise awareness of the importance of chemistry and to improve its general public image. The ECS is engaged in the development of programs with the aim "to enhance the public appreciation of chemistry and its positive contribution to everyday life".

Chemistry in the Eyes of the Society and Young Students

In August 1999, the French Delegation, on behalf of the French Chemical Society at the IUPAC General Assembly in Berlin, Germany, presented a paper concerning the considerable changes in chemistry that have occurred during the last ten years. The image of the chemical industry has been blurred by mergers and scissions and globalization of the activities of multinational companies.

These changes will have consequences in the education that young people will need in order to be of use in the future and to get jobs.

One attitude would be to say that we do not have to worry about this development, because the market will bring about the appropriate solution. This may have been true before the World Trade Organization (WTO), General Agreement on Tariffs and Trade (GATT), and trade-related aspects of intellectual property rights (TRIPS), but not now.

The Egyptian National IUPAC Committee's Action Steps

We concentrate on the bad image that chemistry has in the public's and the student's eyes, in spite of the industrious and costly attempts that have been made to improve matters. In this respect, we are trying to

promote the "Egyptian experiment", which we think still has a long way to go.

Systemic Approach in Teaching Chemistry

Our main concern is the students. First priority are those between the ages of 10–14, and second are the undergraduates.

Prof. Fahmy of Egypt and Prof. J. J. Lagowski of the University of Texas, Austin, Texas, USA, started a campaign to replace the linear approach to teaching chemistry with a systemic one in 1997, and the results presented at the IUPAC Committee on Teaching of Chemistry (CTC) meeting in Berlin in August 1999 were encouraging.

A keynote lecture by Prof. Fahmy during the 16th International Conference on Chemical Education (16th ICCE) in Budapest, Hungary in August 2000 presented applications of the systemic approach to teaching and learning organic chemistry for the 21st century.

Small-Scale Experiments

Another important innovation for raising the interest of young students is the design of simple, safe, and practical chemistry kits that all students can afford.

This concept was introduced by Dr. M. K. El-Marsafy, the R&D manager of El-Nasr Pharmaceutical Chemicals Company, in 1975 during the 28th IUPAC General Assembly at Madrid, Spain. He succeeded in producing a compact chemistry kit and managed to market it to most of the secondary schools in Egypt, thanks to the support of the Minister of Education, Prof. Mostafa Kamal Helmy, and a team of well-trained chemists for promotion and after-sale services.

Unfortunately, this success persuaded private sector companies to produce lower quality and cheaper kits, without having the means and experience to service their products.

Other similar approaches were presented during the 16th ICCE as follows:

- "Hands-on practical chemistry for all", J. D. Bradley, Department of Chemistry, University of the Witwatersrand, Johannesburg, South Africa
- "Development of microscale chemistry during the last ten years in China", N. H. Zou, Hongzhou Teachers College, 310012 Hangzhou, China
- "Small-scale laboratory for high school chemistry", K. Ogino, K. Shoji, K. Kon, T. Tajima, and T. Fujikawa, Japan

Cost-Effective Chemistry

Dr. El-Marsafy and his colleagues at the Faculty of Education, Ain Shams University, demonstrated cost-effective appliances for educative small-scale school chemistry experimentation during the 15th International Conference on Chemical Education (15th ICCE), sponsored by IUPAC and UNESCO and organized by the Chemistry Department, Faculty of Science, at Ain Shams University, 9–14 August 1998. This concept has also been presented internationally on several occasions, including at a conference organized by the Wisconsin Institute of Chemical Education in August 1996.

The trend toward cost-effective chemistry has been very much in focus in various chemistry education institutes in Egypt since 1924. The approach has been tested over a 10-year period at the Faculty of Education in Ain Shams University, with emphasis on two basic features, as follows:

- Students are required to procure and pay for all microscale appliances. The appliances include a simple two-pan balance and 1-ml syringes for quantitative experimentation, as well as vials and plastic dropper bottles to substitute for all conventional glassware in laboratory experiments.
- Students are instructed to perform all the experiments and to submit detailed reports, including written results of their experimentation.

Prof. Grey's book (see photo on p. 106) is of great relevance in bringing into focus the historical perspective of the modern trend of advocating the practice of these micro-methods internationally.

The preface of his book (see p. 107) is prescient in its advocacy of small-scale chemical experiments as a pedagogical tool. The foreword of a book *Microscale Chemistry*, published by the Royal Society of Chemistry (UK) in 1977 (see inset above), reinforces the value of these techniques, which are being promoted vigorously now by IUPAC's CTC.

Foreword from *Microscale Chemistry*

The use of microscale chemistry is gaining momentum worldwide and is now an integral part of courses in North America, France and South Africa as well as in the UK.

The advantages of microscale chemistry are evident in terms of safety and convenience. Microscale experiments also require students to rethink approach to experimental technique and encourages increased accuracy and kill in carrying out procedures.

Microscale chemistry in the UK is currently mainly confined to undergraduate teaching in universities. However, the Royal Society of Chemistry believes that this publication will provide the basis to help establish microscale chemistry at the secondary level.

News from IUPAC

Reflections on Three Decades of IUPAC Participation

Prof. Richard A. Durst (Professor of Chemistry and Chairman, Department of Food Science and Technology, Director of the Cornell Institute of Food Science, Cornell University, Geneva, New York 14456-0462 USA; E-mail: rad2@cornell.edu), currently a Titular Member of the Analytical Chemistry Division (V) Committee, has provided the following reminiscences of his 30-year tenure as an active IUPAC Member:

As my final IUPAC General Assembly approaches, I would like to reflect briefly on my many years of service and participation in IUPAC activities. As we all know, the membership rules were changed some years ago to prevent my level of participation, but I somehow "fell through the cracks". That is, by limiting the number of years one could be a member of IUPAC, it was hoped to bring in fresh ideas and enthusiasm, and perhaps also to dispel the notion of an "old boys' club" mentality. While I am obviously an example of an extreme case, I would like to think that my enthusiasm for IUPAC activities has not diminished in the slightest and that I can still periodically come up with new ideas and worthwhile contributions. I expect that my association with the U.S. National Bureau of Standards (now NIST) provided additional value to my efforts.

In hindsight, my earliest participation as an Associate Member of the Commission on Electrochemistry (I.3) began in 1971 when I was elected at the General Assembly held in Washington, DC, but I was not very active in this Commission until the 28th General Assembly in Madrid in 1975. After rather minimal contributions to this Commission, I was elected (or perhaps deported) in 1979 to the Commission on Electroanalytical Chemistry (V.5), where my expertise was more relevant to the ongoing and future projects. I eventually became Chairman of this Commission and subsequently was elected to the Analytical Chemistry Division (V) Committee, where I have remained until my final function at the General Assembly in Brisbane in July 2001.

It has been a wonderful experience for me to work with some of the most outstanding chemists in the world; first as a wide-eyed and awestruck young scientist and, later, as a more mature (older?) scientist who was still impressed with his association with world-class colleagues. While I have tried my best to fulfill my various duties in IUPAC, I hope that my contributions have justified my many years of effort and participation.

I don't know if my tenure in IUPAC is a longevity record or not; that is not important except perhaps for the *Guinness Book of Records*. What is important is how my colleagues judge my contributions to the objectives of IUPAC. As always, I have tried to do my best for IUPAC, and I wish all of you great success in the coming years. I shall continue to follow the activities of IUPAC closely and hope that I may be called upon in the future to assist in the projects of the Working Groups.

Report on International IUPAC Workshop on Fats, Oils, and Oilseeds Analysis, Rio de Janeiro, Brazil, 21–22 November 2000

Dr. Regina C. A. Lago (CTAA/Embrapa Food Technology, Avenida das Américas 29501, Guaratiba, 23020-470 Rio de Janeiro-RJ, Brazil; E-mail: lago@ctaa.embrapa.br), Titular Member of the IUPAC Commission on Food (VI.5), has submitted the following report:

This workshop (Project No. 1999-042-1-600) was the first of its kind held by IUPAC in Brazil/Latin America. It was organized by the National Research Center for Food Technology of Embrapa, the Brazilian Agricultural Research Organization, and Dr. Regina Lago, of the Local Organizing Committee, which had as members Dr. Sonia M. Cabral de Menezes (Petrobrás, Titular Member of the IUPAC Commission on Molecular Structure and Spectroscopy, I.5) and Dr. Rosemar Antoniassi (Embrapa).

Brazil is a well-known vegetable oil producer (mainly of soybean oil), and this workshop presented a good opportunity for sharing industrial and academic experiences. Despite the geographical difficulties of holding the event in Rio de Janeiro, which is not a vegetable oil-producing or -processing state, the workshop attracted more than 80 participants, mostly from Brazil but also from Uruguay, Colombia, and Venezuela.

The program began with a general look at the importance of analytical data in fat technology, and it next proceeded to a discussion of the main organizations that develop/validate methods for lipid analysis (IUPAC, AOCS, and AOAC International). Because the origin of fat differs from that of food samples, the problem of lipid extraction from different matrices was treated. Three topics related to nutritional aspects were also considered on the first day: quality control of frying fats, an oxidative stability index, and phytosterols as nutraceutical products.

The Organizing Committee. From left to right, second row: Paul Kolodziejczyk, Carmen Dobarganes, and Marshall Pike; first row: Sonia Cabral de Menezes, Patrick Dysseler, Regina Lago, and Rasemar Antoniassi.

On the second day, instrumental analysis of fats and oils was emphasized, including *trans* fatty acid determination by high-resolution GC, NMR applications to lipid analysis, and ICP-MS for oilseed analysis. Analytical criteria for quality and purity evaluation of olive oils were also discussed, as well as the Codex and FOSFA requirements for storage and shipping of oils and fats and analytical methods requirements.

The interlaboratory collaborative studies carried out by the previous IUPAC Commission on Oils, Fats, and Derivatives (previously VI.6, and now merged into the Commission on Food, VI.5) resulting in the IUPAC Standard Methods for the Analysis of Oils, Fats, and Derivatives (now undergoing revision that will lead to the 8th Edition) were stressed in most of the workshop sessions. A summary was printed and distributed to all participants.

Supporters of the workshop, in addition to IUPAC and Embrapa Food Technology, included FAPERJ (the Rio de Janeiro State Research Funding Agency), SBOG (Brazilian Society of Oils and Fats), SBCTA (Brazilian Society of Food Science and Technology), Nestlé Brazil, and Bank of Brazil.

The workshop provided a timely opportunity to pay homage to Dr. Leopold Hartman for his contribution to lipid chemistry. Dr. Hartman has been living in Brazil for more than three decades, and he is now 96 years old.

According to many comments and messages received, the workshop was considered a success.

Highlights from the Web

New Look of www.iupac.org

In mid-May, IUPAC opened its redesigned home page, unveiling a new look with added features. This new page is the first part of an effort to make the deeper organizational structure of the site more transparent to the visitor and more user-friendly, especially for those unfamiliar with IUPAC. It also puts up front some of the themes most closely associated with IUPAC, such as the names of the chemical elements, nomenclature and symbols, education, and industry. Designed by Hollis Oberlies from Purple Zante, Inc., and implemented by Joe Komenda at komejo.com, the IUPAC home page, with its light graphics and direct access to about 50 pages, is more appealing and versatile.

While the site is steadily growing in size, the site map as published in *CI*, Vol. 21, No. 4, pp. 112–113, 1999, remains essentially unchanged. Among the

most recently added features is the electronic newsletter, IUPAC e-news, informing you of what's new in IUPAC and on the IUPAC web site. Note that if you recently changed your e-mail address, you must resubscribe to IUPAC e-news directly online at http://www.iupac.org/news/e-news.html/.

Fabienne Meyers
IUPAC Secretariat

Reports from IUPAC-Sponsored Symposia

International Symposium on Green Chemistry, 10–13 January 2001, Delhi, India

More than 150 people attended this symposium, many of them coming from abroad. Fifteen countries were represented, thus showing widespread international interest in the subject.

The symposium was organized by Dr. M. Kidwai (Department of Chemistry, University of Delhi, India), and Prof. James Clark (Department of Chemistry, University of York, England, UK) served as the President and Symposium Editor. The inaugural lecture was given by Prof. Clark during an impressive opening ceremony.

Prof. Pietro R. Tundo, the Official IUPAC representative to the symposium, presented greetings from IUPAC at the opening ceremony, during which he reported on the existing IUPAC activities related to green chemistry worldwide (see box below) and particularly in the less-developed countries. The term "green chemistry", as adopted by the IUPAC Working Party on Synthetic Pathways and Processes in Green Chemistry, is defined as: "The invention, design, and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances".

Environmental protection has to have singular attention in India because of the unprecedented development of that country. International cooperation between the countries of the world will play a fundamental role in the progress of green chemistry, and IUPAC itself may address the progress toward a scientific and intelligent trend.

Main topics covered by the symposium included new clean reagents, new organic syntheses, new environmental friendly polymers, catalysis, process intensification, and biocatalysis. There were 7 plenary lectures and 13 invited lectures. Selected lectures from the symposium were published in the January 2001 issue of *Pure and Applied Chemistry* (*PAC*, Vol. 73, No. 1, pp. 77–203, 2001).

Research and educational networks operating in green chemistry were also presented and include the following: Interuniversity Consortium of Chemistry for the Environment (http://www.unive.it/inca), UK Green Chemistry Network (http://www.chemsoc.org/gcn), and Green Chemistry Institute (http://

Some IUPAC Events Related to Green Chemistry

- Founding of the IUPAC Working Party on Synthetic Pathways and Processes in Green Chemistry (Seoul, Korea, August 1996)
- International Conference on Challenging Perspectives on Green Chemistry (Venice, Italy, September 1997)
- Meeting of the IUPAC Working Party on Synthetic Pathways and Processes in Green Chemistry (Venice, Italy, October 1998)
- 13th International Conference on Organic Synthesis (ICOS-13) Minisymposium on Green Organic Synthesis (Warsaw, Poland, 1–5 July 2000)
- Special Topic Issue and Symposium-in-Print on Green Chemistry (*Pure and Applied Chemistry*, Vol. 72, No. 7, July 2000)
- Establishment of the Subcommittee on Green Chemistry within Commission III.2 (December 2000)
- International Symposium on Green Chemistry (Delhi, India, 10–13 January 2001)
- CHEMRAWN XIV—Toward Environmentally Benign Processes and Products (Boulder, Colorado, 9–13 June 2001)
- 38th IUPAC Congress/World Chemistry Congress, Scientific Program Theme on Environmental Chemistry and the Greening of Industry (Brisbane, Australia, 1–6 July 2001) and IUPAC Committee on Teaching of Chemistry, Satellite Conference (Brisbane, Australia, 1 July 2001)
- IUPAC Subcommittee on Green Chemistry Workshop on Education in Green Chemistry (Venice, Italy, 12–14 September 2001) (see announcement in *CI*, Vol. 23, No. 3, p. 90, May 2001)

www.lanl.gov/greenchemistry).

Expectations for the symposium among the political world of Delhi were really high. Prof. Deepak Nayyar, Vice-Chancellor of the University of Delhi, welcomed attendees on behalf of the University of Delhi, and Dr. Sheila Dikshit, Chief Minister of the National Capital Territory of Delhi, expressed her wish that the symposium would help chemists to update Indian science with what is new on the international scene. She declared herself to be strongly interested and expressed her belief that Delhi development will require cleaner production and management for a better environment.

Hospitality and coordination by the symposium organizers were excellent.

Prof. Pietro R. Tundo
Associate Member, IUPAC Commission on Physical Organic Chemistry (III.2)
Department of Environmental Sciences
University Ca' Foscari of Venice
Venice, Italy

New Projects

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

Collecting, Testing, and Disseminating Experiments in Solid-State and Materials Chemistry

IUPAC has approved a two-year project to provide tested experiments in the fields of solid-state and materials chemistry to be introduced into the chemistry and materials science curriculum. The experiments that will be submitted can be used for junior and senior undergraduates as projects, and for masters students as laboratory courses. Because in recent years the development of high-technology materials is a very important issue, this project will be very useful in advancing the preparation of novel compounds.

Testing of experiments once they are prepared will be accomplished by another laboratory or by students. The range of topics would be broadened by considering different synthesis methods, such as solid-state, solution, hydrothermal, or sol-gel reactions. Characterization by different instrumental methods and determination of magnetic, electrical, optical, thermal, and mechanical properties could also be considered.

Comments from the chemistry and materials science communities are welcome and should be addressed to the project coordinator, Prof. Meral Kizilyalli, Department of Chemistry, Middle East Technical University, Ankara 06531, Turkey; Tel.: +90 312 2103208; Fax: +90 312 2101280; E-mail: meralk@metu.edu.tr.

See http://www.iupac.org/projects/2000/2000-020-2-200.html for project description and update.

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* (*PAC*).

If you would like to comment on the provisional recommendations, please visit the IUPAC web site at http://www.iupac.org/reports/provisional/index.html, where the full texts are available for downloading as draft pdf files. Alternatively, you can write to your nearest national/regional center to request a copy; the most recent list of national/regional centers is available on the web site at the address above and last appeared in *CI*, Vol. 17, p. 141 (1997).

Organic and Biomolecular Chemistry Division. Commission on Nomenclature of Organic Chemistry—Nomenclature for the C_{60}–I_h and C_{70}–$D_{5h(6)}$ Fullerenes

<http://www.iupac.org/reports/provisional/abstract01/powell_301101.html>

Fullerenes are a new allotrope of carbon characterized by a closed-cage structure consisting of an even number of three coordinate carbon atoms devoid of hydrogen atoms. This class was originally limited to closed-cage structures with twelve isolated five-membered rings, the rest being six-membered rings.

Although it was recognized that organic ring nomenclature could be used for these structures, the resulting names would be extremely unwieldy and inconvenient for use. At the same time, it was also recognized that established organic principles could

be used, or adapted, to provide a consistent nomenclature for this unique class of compounds based on the class name fullerene. However, it was necessary to develop an entirely new method for uniquely numbering closed-cage systems.

This paper describes IUPAC recommendations for naming and uniquely numbering the two most common fullerenes with isolated pentagons, the icosahedral C_{60} fullerene and the D_{5h}–C_{70} fullerene. It also describes adaptations of organic nomenclature principles for naming derivatives of fullerenes with nonclosed-cage structures, heterofullerenes, derivatives formed by substitution of hydrofullerenes, and the fusion of organic rings or ring systems to the fullerene cage. Finally, this paper suggests methods for describing structures consisting of two or more fullerene units and for denoting configurations of chiral fullerenes and their derivatives.

Comments by 30 November 2001 to Dr. Warren H. Powell, 1436 Havencrest Court, Columbus, Ohio 43220-3841, USA; Tel.: +1-614-451-1830, E-mail: wpowell2@juno.com

New Books and Publications

New Publications from the World Health Organization

Carbon Monoxide, Environmental Health Criteria No. 213

1999, xxiv + 464 pages (English, with summaries in French and Spanish), ISBN 92-4-157213-2, CHF 96.-/USD 86.40; In developing countries: CHF 67.20, Order No. 1160213. WHO Marketing and Dissemination, CH-1211 Geneva 27, Switzerland; Tel.: +41 22 791 24 76; Fax: +41 22 791 48 57; E-mail: bookorders@who.ch.

This book evaluates the risks to human health and the environment posed by exposure to carbon monoxide, a colorless, odorless gas produced by both natural and anthropogenic processes. Concerns about the potential health effects of exposure have been addressed in extensive studies with both humans and a range of animal species. Although studies of carbon monoxide poisoning are included, the report gives major attention to possible health risks linked to the relatively low concentrations that characterize most exposures. The report also aims to identify subpopulations that may be especially susceptible to adverse health effects. Close to 1 000 references are included in this comprehensive assessment.

Concerning environmental levels arising from human activities, highway vehicle emissions are considered the principal source, followed by emissions from nonhighway transportation sources, other fuel combustion sources, industrial processes, and solid waste disposal. Evidence from monitoring stations supports the conclusion that environmental concentrations are declining, reflecting the efficacy of emission control devices on newer vehicles. The report also considers the factors that contribute to indoor concentrations, with cigarette smoke singled out as a major source.

A chapter on environmental distribution and transformation summarizes what is known about the environmental fate of carbon monoxide, its contribution to ozone production in the troposphere, and its possible role in global warming. Sources of personal exposure are considered in the next chapter, which concludes that the most important exposures for the general population occur in the vehicle and indoor macroenvironments. Several occupations involving an increased risk of high exposures are also identified. Toxicokinetics and mechanisms of action are reviewed in the next chapter, which discusses the many factors that influence the concentrations of carboxyhemoglobin in blood, and summarizes what is known about the primary mechanisms by which carboxyhemoglobin formation exerts its toxic effects.

The remaining chapters consider adverse effects on health. A review of the abundant findings from animal studies helps elucidate the mechanisms of carbon monoxide toxicity, its direct effects on the blood and other tissues, and the manifestations of these effects in the form of changes in organ function. Studies of developmental toxicity provide strong evidence that material exposure produces reductions in birth weight, cardiomegaly, delays in behavioral development, and disruptions in cognitive function.

A chapter on health effects in humans considers numerous investigations of adverse effects linked to typical ambient exposure levels. Findings are summarized in terms of damage to the cardiovascular and respiratory systems, effects on neurobehavioral functions, developmental toxicity, and other systemic effects. Also considered are the effects of exposure at high altitudes, in users of psychoactive drugs, and in combination with exposure to other air pollutants.

An evaluation of high-risk groups concludes that patients with reproducible exercise-induced ischemia are a sensitive group at increased risk for experiencitig adverse health effects. The report also found evidence indicating that exposure may cause an increased risk of sudden death from arrhythmia in patients with coronary artery disease. The report further concludes that exposure during pregnancy and early childhood carries a number of important risks.

Concerning accidental exposure to high concentrations, the report concludes that carbon monoxide poisoning occurs frequently, has severe consequences (including immediate death), involves complications and late sequelae, and is often overlooked.

Among its many other conclusions, the report calls for better education of the general population about the risks of exposure, especially in individuals with cardiovascular and respiratory disease, and better awareness among medical professions of the dangers of carbon monoxide exposure during pregnancy.

Human Exposure Assessment, Environmental Health Criteria No. 214

2000, xxx + 375 pages (English, with summaries in French and Spanish), ISBN 92-4-157214-0, CHF 78.-/USD 70.20; In developing countries: CHF 54.60, Order No. 1160214.

This book offers an up-to-date guide to the concepts, procedures, statistical methods, and models used to assess human exposure to environmental chemicals. Noting that exposure assessment is a comparatively new discipline of the environmental sciences, the book aims to encourage its use as a powerful tool for measuring actual levels of exposure and determining whether interventions are needed to protect public health. With this goal in mind, the book gives researchers expert advice on the design and conduct of studies, the interpretation of findings, and the best methods for ensuring the reliability and reproducibility of results. Throughout, emphasis is placed on the ways in which well-designed exposure assessments can enhance the practical value of findings from traditional epidemiological and toxicological investigations.

The book has twelve chapters. The first six cover conceptual and methodological issues. Chapter 1 introduces basic concepts used in exposure assessment, and describes direct and indirect methods of measuring or estimating actual exposure and determining whether intervention is required. The uses of human exposure data are covered in Chapter 2, which explains how studies of human exposure can reduce the uncertainty of estimates used in epidemiology, risk assessment, and risk management. Chapter 3 considers several generic study designs and approaches, and compares their advantages and limitations. Chapter 4, on statistical methods, discusses selective applications of descriptive and inferential statistics, using data on lead exposure as an example. Subsequent chapters review methods for the collection and application of time-use data, and introduce the principles, methods, and data requirements of exposure modeling.

Against this background, chapters in the second half of the book offer practical advice on the design and conduct of studies aimed at assessing exposure to chemicals in different environmental media. Separate chapters describe sampling methods used to analyze chemical concentrations in air, water, and food, and in soil and settled dust. Environmental allergens that can contribute to disease or alter susceptibility are considered in Chapter 9, which concentrates on methods for measuring particles from house dust mites and their feces, allergens from pets and cockroaches, and allergens or toxins from fungi, bacteria, and pollen.

Subsequent chapters describe the use of biological markers in exposure assessment, and discuss issues surrounding the quality assurance of exposure studies and results. The final chapter presents brief summaries and examples of exposure studies in order to illustrate different study designs for different objectives, target pollutants, and populations. Studies that show how exposure assessment supports epidemiology and risk management, particularly in developing countries, are also included.

Vinyl Chloride, Environmental Health Criteria No. 215

1999, xxi + 356 pages (English, with summaries in French and Spanish), ISBN 92-4-157215-9, CHF 72.-/USD 64.80; In developing countries: CHF 50.40, Order No. 1160215.

This book evaluates the risks to human health and the environment posed by exposure to vinyl chloride, a colorless, flammable gas manufactured almost exclusively for use in the production of polyvinyl chloride (PVC). PVC is used to produce plastic materials having wide applications in the building sector, packaging, electrical appliances, medical care, agriculture, the automotive industry, and toys.

Conclusive evidence that vinyl chloride causes cancer in humans led to the lowering, in the early 1970s, of occupational exposure limits in several countries. At the same time, many countries imposed restrictions on the levels of residual vinyl chloride permitted in PVC, thus reducing the risk that residues in packaging materials might contaminate food items, pharmaceutical products, and cosmetics.

A chapter on sources of human and environmental exposure covers production levels and processes, noting the recent geographical expansion of production plants to Southeast Asia, Eastern Europe, the Indian subcontinent, and oil-producing countries. Production technologies that lead to lower residual levels of PVC are also briefly described. A review of data on the environmental fate of vinyl chloride notes that environmental releases are almost entirely in the vapor phase. Vinyl chloride is rapidly volatilized and removed from surface water and soil, but is not easily biodegraded. Evidence suggests some bioaccumulation within the food chain, but no biomagnification.

Concerning human exposure, the report concludes that atmospheric concentrations in ambient air are low, resulting in very little exposure of the general population. Much higher concentrations have been recorded near industry and waste disposal sites, and following accidental spills, including spills of chlorinated solvents in dry cleaning shops. Findings confirm a reduced risk of exposure for the general population via residues in packaging materials. The report identifies inhalation as the main route for occupational exposure, which occurs primarily in plants producing vinyl chloride and PVC.

A chapter on kinetics and metabolism in laboratory animals and humans concludes that vinyl chloride is rapidly absorbed and widely distributed following exposure via the inhalation and oral routes. Following inhalation, the main metabolic route involves oxidation to form chloroethylene oxide, which is rapidly transformed to chloroacetaldehyde.

Effects on laboratory mammals and *in vitro* test systems have been extensively studied. The compound shows low acute toxicity when administered by inhalation. Long-term feeding studies in several species show significantly increased incidences of liver angiosarcoma, hepatocellular carcinoma, and tumors at several other organ sites.

An assessment of effects on humans draws on clinical findings following accidental exposures, supported by a large number of well-designed epidemiological studies of occupationally exposed workers. Apart from defining the symptoms of "vinyl chloride illness", these studies provide strong and consistent evidence that vinyl chloride causes the rare tumor, angiosarcoma of the liver. Brain tumors and hepatocellular carcinoma may also be associated with exposure, though the evidence is less conclusive.

On the basis of this analysis, the report calls for measures to minimize emissions at production sites and sanitary landfills, and to ensure low residual levels in PVC. Moreover, as vinyl chloride is a known carcinogen, the report stresses the need to keep occupational exposures as low as possible and to educate workers about the risks involved and the need for safe working procedures.

Bacillus thuringiensis, Environmental Health Criteria No. 217

1999, xv + 105 pages (English, with summaries in French and Spanish), ISBN 92-4-157217-5, CHF 27.-/USD 24.30; In developing countries: CHF 11.20, Order No. 1160217.

This book evaluates the risks to human health and the environment posed by the use of *Bacillus thuringiensis* (Bt) as a microbial agent for pest control. Products containing various Bt subspecies are increasingly used worldwide to control the larvae of several insect pests that threaten major agricultural crops and forests. Bt products are also being used to control the insect vectors of malaria, onchocerciasis, and other diseases of major public health importance. The bacterium is also a key source of genes for transgenic expression to provide pest resistance in plants and microorganisms.

The report opens with an overview of the biological properties of Bt and commercial Bt products. Particular attention is given to the mechanisms by which sporulation produces inclusion bodies, containing insecticidal crystalline proteins, which are selectively toxic for insect species in the orders *Coleoptera, Diptera,* and *Lepidoptera*. Tables show the current classification of 67 Bt subspecies and the large number of genes coding for the insecticidal crystalline proteins. A review of Bt metabolites found in commercial products concludes that they pose no hazards to humans or the environment.

Chapter 2 reviews data elucidating the mechanisms by which Bt exerts its toxic action on susceptible insect larvae. Data on insect populations that are resistant to Bt are also briefly considered. Chapter 3, which focuses on the survival and activity of Bt in the environment, compares habitats where Bt subspecies occur naturally with treated habitats. Particular attention is given to the ability of Bt to form endospores that are resistant to inactivation by heat and desiccation and that persist in the environment under adverse conditions. A chapter on commercial production describes methods of production and general patterns of use in agriculture and forestry, and in large-scale programs to control the vectors of malaria and onchocerciasis.

The most extensive chapter evaluates the large number of studies conducted to assess the toxicity of various preparations containing insecticidal crystalline proteins, spores, and vegetative cells. Laboratory studies in a range of species have failed to

demonstrate toxic or pathogenic effects. Field studies have likewise failed to demonstrate adverse effects on birds, earthworms, fish, other aquatic vertebrates, and nontarget aquatic invertebrates. An evaluation of effects on humans draws on studies in volunteers, case reports from occupationally exposed workers, and extensive data from countries where Bt products are added to drinking-water for mosquito control or used to treat rivers for blackfly control.

On the basis of this review, the report concludes that Bt products are unlikely to pose any hazard to humans or other vertebrates or to the great majority of nontarget invertebrates, provided that the commercial product is free from non-Bt microorganisms and biologically active products other than the insecticidal crystalline proteins. The report further concludes that Bt products can be safely used for the control of insect pests of agricultural and horticultural crops and forests. These products are likewise judged safe for use in aquatic environments, including drinking-water reservoirs, for the control of mosquito, blackfly, and nuisance insect larvae. The report stresses, however, that vegetative Bt has the potential to produce *Bacillus cereus*-like toxins whose significance as a possible cause of human gastrointestinal disease remains unknown.

Awards and Prizes

Elsa Reichmanis Wins Perkin Medal

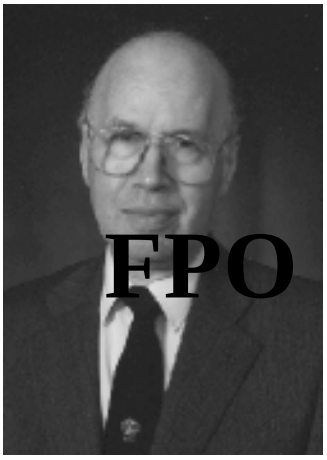
Dr. Elsa Reichmanis

Dr. Elsa Reichmanis (Director, Polymer and Organic Materials Research Department, Bell Labs, Lucent Technologies, 600 Mountain Avenue, Murray Hill, New Jersey 07974, USA; E-mail: er@lucent.com), Titular Member of the IUPAC Macromolecular Division (IV) Committee, has won the prestigious 2001 Perkin Medal, one of the highest honors the U.S. chemical industry can bestow. The American Section of the London-based Society of Chemical Industry (SCI) awards the Perkin Medal annually to a scientist or engineer for outstanding contributions to applied chemistry. The awardee is chosen by a representative panel from the American Chemical Society, the American Institute of Chemists, the American Institute of Chemical Engineers, the Electrochemical Society, and the American Section of Société de Chimie Industrielle. The Perkin Medal commemorates Sir William H. Perkin's (1838–1907) discovery in 1856 of the first synthetic dye (mauve). Perkin was also the founder of SCI.

Dr. Reichmanis received the award for her development of new photoresists for microlithography, the process of producing very small patterns on silicon substrates for use in integrated circuits. At the 221st ACS National Meeting in San Diego last April, Dr. Reichmanis was selected as one of two candidates to stand for election as 2002 ACS President-Elect this fall.

Gerard P. Moss Wins Patterson–Crane Award

Dr. Gerard P. Moss (Senior Lecturer, Department of Chemistry, Queen Mary and Westfield College of the University of London, Mile End Road, London E1 4NS, England, UK; E-mail: g.p.moss@qmw.ac.uk), a National Representative on the Commission on Nomenclature of Organic Chemistry (III.1), is the 2001 recipient of the Patterson–Crane Award presented biennially by the Dayton and Columbus Sections of the American Chemical Society. The award, given in honor of two previous editors of *Chemical Abstracts*, Austin M. Patterson and E. J. Crane, recognizes outstanding contributions in chemical information theory or practice.



Dr. Gerard P. Moss

The award, presented in Dayton, Ohio, USA on 8 May 2001, recognizes Dr. Moss for his international contributions to chemical information science and documentation. He has been ac-

tively involved during the last quarter century with most of the international chemical nomenclature documents published by the Commission on Nomenclature of Organic Chemistry (III.1), the Joint Commission on Biochemical Nomenclature (JCBN), and the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (IUBMB). His work in disseminating this information through the World Wide Web is particularly impressive (see http://www.iupac.org/). This online resource for IUPAC nomenclature recommendations, developed and maintained by Dr. Moss, now includes almost all of the organic and biochemical documents and attracted over a third of a million users during the past year.

Other significant accomplishments of Dr. Moss include his revision and systematization of Austin Patterson's fused and bridged fused ring nomenclature, his service on numerous nomenclature commissions, and the published nomenclature recommendations with which he has been involved.

Nicola Senesi Receives "Honoris Causa" from Institut National Polytechnique de Toulouse (INPT)

Prof. Nicola Senesi (Department of Agroforestal and Environmental Biology and Chemistry, University of Bari, Via G. Amendola 165/A, I-70126 Bari, Italy; E-mail: senesi@agr.uniba.it), Titular Member of the Commission on Fundamental and Environmental Chemistry (VI.1), has been conferred the title of Doctor Honoris Causa from the Institut National Polytechnique de Toulouse (INPT), France. The honor was awarded to Prof. Senesi by the President of INPT during an official ceremony held on 18 May 2000 at the École National Superieure Agronomique de Toulouse (ENSAT). Prof. Senesi was the President of the International Humic Substances Society (IHSS) and Chairman of Commission II (Soil Chemistry) of the International Union of Soil Sciences (IUSS). He is a Fellow of the Soil Science Society of America (SSSA) and of the American Society of Agronomy (ASA); a Golden Medal winner of the Polish Soil Science Society; and Associate Editor of *Soil Science*, the *European Journal of Soil Science*, *Geoderma*, the *Journal of Environmental Science and Health*, and *Humic Substances in the Environment*.

Prof. Nicola Senesi

Conference Announcements

designates IUPAC sponsorship

8th Symposium on Chemistry and Fate of Modern Pesticides, 21–24 August 2001, Copenhagen, Denmark

This symposium is organized by the International Association of Environmental Analytical Chemistry (IAEAC) in cooperation with the Danish Institute of Agricultural Sciences (DIAS), the Royal Veterinary and Agricultural University (KLV), the Danish National Environmental Research Institute, the Danish Ministry of Environment and Energy (NERI), and the Geological Survey of Denmark (GEUS).

Main topics of the symposium include the following:

- modeling pesticide fates in the environment
- laboratory versus field experiments
- pesticides in the atmosphere and ground water
- quality assurance in pesticide analysis (sampling, uncertainty measurements)
- analysis and fate of plant-produced pesticides
- other aspects in the fate and chemistry of modern measurements

For more information, contact National Organizing Committee, Inge S. Fomsgaard, DIAS, Denmark; E-mail: Inge.Fomsgaard@agrsci.dk or Chemfate.2001@agrsci.dk; Web site: http://www.agrsci.dk/plb/chemfate2001/.

17th Institute of Nutritional Sciences (IUNS) International Congress of Nutrition 2001 on Modern Aspects of Nutrition—Present Knowledge and Future Perspectives, 27–31 August 2001, Vienna, Austria

For additional information, contact Dr. Ibrahim Elmadfa, Institute of Nutritional Sciences,

Althanstrasse 14, A-1090 Vienna, Austria; E-mail: ibrahim.elmadfa@univie.ac.at; Tel.: +43 1 31 336 8213; Fax: +43 1 31 336 773.

5th International Electronic Conference on Synthetic Organic Chemistry (ECSOC-5), 1–30 September 2001

This online conference will feature the following section and symposium topics:

- general organic synthesis
- solid-phase chemistry and combinatorial synthesis
- bioorganic chemistry and natural products
- selenium and tellurium chemistry
- microwave-assisted synthesis

For further information (including consideration of papers, research notes, or reviews for presentation as electronic posters), contact Prof. Dr. C. Oliver Kappe, Institute of Chemistry, Karl-Franzens-University of Graz, Henirichstrasse 28, A-8010 Graz, Austria; E-mail: oliver.kappe@uni-graz.at; Tel.: +43 316 380 5352; Fax: +43 316 380 9840; Web site: http://www.mdpi.net/ecsoc-5/.

115th AOAC INTERNATIONAL Annual Meeting and Exposition, 9–13 September 2001, Kansas City, Missouri, USA

This meeting focuses on analytical methodology and laboratory management for chemists, other research scientists, laboratory managers, quality control professionals, regulatory staff, microbiologists, public health authorities, company presidents and chief executive officers, and marketing and sales professionals working in analysis of foods, beverages, feeds, fertilizers, pesticides, soil, water, human and animal drugs, hazardous wastes, forensics, and other related areas. Contributed papers have been invited in the following specific topic areas: drugs and antibiotics in foods and feeds, antimicrobials and disinfectant formulations, food safety—pathogens/allergens, botanicals/dietary supplements/nutraceuticals, pesticide formulations and pesticide residues, genetically modified organisms (GMOs), quality assurance/accreditation, reference materials, analysis for global trade, new technologies, student research, and general analytical methods.

Scheduled topical symposia will address the latest developments in accuracy and precision of microbiological methods, *Campylobacter*, characterization of microorganisms by mass spectrometry, crop nutrients, DNA, forum on methods for antibiotics and drugs in feeds, food allergens, genetically modified organisms (GMOs), international regulatory forum, laboratory accreditation and proficiency testing, measurement systems for herbal and dietary supplements, microbiological risk assessments, seafood toxins, TLC for herbal products, trace environmental analysis, and biosensor technology.

The meeting will also feature numerous poster sessions to give attendees the chance to talk with presenters one-on-one. A large laboratory exposition will display the latest in state-of-the-art analytical laboratory products and services, and will provide the opportunity to discuss needs with more than 90 vendors and learn about how to improve your laboratory.

Hands-on training courses held before and after the meeting will include sessions on ISO 17025 management systems for the laboratory, quality assurance for microbiological laboratories, principles of statistical analysis and measurement uncertainty, quality assurance for analytical laboratories, and auditing ISO management systems.

For more information, contact the AOAC International Meetings Department, 481 North Frederick Avenue, Suite 500, Gaithersburg, Maryland 20877-2417, USA; E-mail: meetings@aoac.org; Tel: +1-800-379-2622 from North America or +1-301-924-7077 worldwide; Fax: +1-301-924-7089; Web site: http://www.aoac.org/. The web site will have regularly updated information about the meeting.

5th International Symposium on Biological Monitoring in Occupational and Environmental Health, 18–21 September 2001, Banff, Alberta, Canada

For additional information,contact Continuing Medical Education, University of Calgary, Health Sciences Centre, 3330 Hospital Dr. N.W., Calgary, AB T2N 4N1, Canada; E-mail: isbm@ucalgary.ca; Tel.: +1 403 270 2330; Fax: +1 403 220 7032.

1st NIAF-MeRinOS Joint Meeting on Fundamental and Applied Aspects of Organic Synthesis, 28 September–2 October 2001, Houffalize, Belgium

This meeting is being organized in order to gather scientists from different origins (academia and industry) and different cultures (Japan and Europe) to summarize the state of the art and to foresee novel trends in organic synthesis and related fields. These objectives are among those that both the Noyori Industry and Academia Forum (NIAF) in Japan and the Mease-Rhine Network on Organic Synthesis (MeRinOS) in Europe want to achieve.

The meeting will include 3 short courses, 25 lectures by established scientists, 2 award lectures from young chemists, and 3 poster sessions featuring up to 50 posters each. Attendance will be limited to 250 scientific participants, with priority going to confirmed researchers and to those who register first.

For further information, contact Prof. Alain Krief, Laboratoire COS, 61, rue de Bruxelles, 5000 Namur, Belgium; E-mail: secretariat-cos@fundp.ac.be; Tel.: +32 81 724559; Fax: +32 81 724536; Web site: http://www.fundp.ac.be/niaf-merinos/.

Formula III. New Concepts and Strategies in Formulation: From the Laboratory to the Industry, 13–16 October 2001, La Grande Motte en Petite Carmargue (Hérault), France

This aim of this congress is to provide the opportunity for researchers from academia as well as from industry to meet and to discuss the various topics concerned with formulation problems, including physicochemical and process aspects, characterization methods, methodologies, and industrial applications.

The three main themes of the congresss will focus on:

- complex fluids (including solvents, gels, foams, emulsions, and suspensions)
- pastes and powders (including plastics, cements, pigments, and ceramics)
- new methodologies (including chemiometry, deformulation, QSPR, characterization, and combinatorial approach)

A trade exhibition will be held at the meeting. Societies, scientific publishers, and interested companies are invited to contact the Secretariat of the Congress, listed below.

For more information, contact Conference Secretariat, c/o Chantal Iannarelli, Congrès Scientifiques Services (c2s), 2 rue des Villarmains, BP 124, F-92210 Saint Cloud, France; E-mail: c2s@club-internet.fr; Tel.: +33 1 47 71 90 04; Fax: +33 1 47 71 90 05; Web site: http://www.congres-scientifiques.com/Formula3/ or Scientific Secretariat, c/o Dir. Françoise Lafuma, ESPCI, Lab. Physico-Chimie Macromoléculaire UMR 7615, 10 rue Vauquelin, F-75231 Paris, Cedex 05, France; E-mail: francoise.lafuma@espci.fr; Tel.: +33 1 40 79 44 36; Fax: +33 1 40 79 46 40.

51st Canadian Chemical Engineering Conference. 2001: A Chemical Engineering Odyssey, 14–17 October 2001, Halifax, Nova Scotia, Canada

This meeting will focus on the following six fields of chemical engineering that are growing in importance:

- energy industry (including offshore energy production, management, separations, and pipelines)
- environment (climate change, acid rain, sustainable development, site remediation, and waste management)
- materials (including polymers, biomaterials, composites, metals, and manufacturing applications)
- process integration (including training workshop, pinch technology, energy integration, mass integration, and waste minimization)
- process safety and loss management (including responsible care, process safety management, explosions, and accident prevention)
- pulp and paper (cosponsored by PAPTAC and focusing on improving mill performance)

Advances in new areas of chemical engineering and results of research in the fundamental traditional subject areas of the profession will be featured in technical sessions on biomedical, biotechnology, business and economics, education, extractive metallurgy, food processing, forestry/pulp and paper, instrumentation, mixing, electrochemical engineering, fundamentals, kinetics/reactors/catalysis, process control, rheology, simulation, software, statistics and mathematical methods, and transport phenomena.

For further information, contact Conference Chair, Department of Chemical Engineering,

Dalhousie University, Halifax, Nova Scotia B3J 2X4, Canada; E-mail: CsChE.Conference@Dal.Ca; Tel.: +1 902 494 3953; Web site: http://www.chemeng.ca/halifax2001/.

International Symposium on Functional Foods: Scientific and Global Perspectives, 17–19 October 2001, Paris, France

For additional information, contact Dr. Berry Danse, International Life Sciences Institute (ILSI) Europe, Avenue E. Mournier, 83, Box 6, 1200 Brussels, Belgium; E-mail: publications@ilsieurope.be; Tel.: +32 2 771 00 14; Fax: +32 2 762 00 44; Web site: http://www.ilsi.org/conference.html.

Food Ingredients (FI) Europe International Exhibition and Conference on Food Ingredients, Semi-Finished Products, Product Development, and Quality Control, 5–7 November 2001, London, England, UK

For more information, contact Ivonne Twigt, Miller Freeman BV; E-mail: mbos@unmf.com; Tel.: +31 346 559444; Fax: +31 346 573811; Web site: http://www.fi-events.com/summit/.

Food Ingredients (FI) Central & Eastern Europe International Exhibition and Conference on Food Ingredients, Semi-Finished Products, Product Development, and Quality Control, 28–30 November 2001, Moscow, Russia

For more information, contact Ivonne Twigt, Miller Freeman BV; E-mail: Roudejans@unmf.com; Tel.: +31 346 559444; Fax: +31 346 573811; Web site: http://www.fi-events.com/cee/.

International Congress of Chemistry and Environment, 16–18 December 2001, Indore, India

This meeting is being organized under the auspices of the *Research Journal of Chemistry and Environment* to focus attention on "Science and Technology for Prevention and Management of Environmental Emergencies", including natural calamities such as earthquakes, volcanic activity, wildfires, landslides, avalanches, floods, drought, hail storms, tornadoes, hurricanes, winter storms, and other catastrophes. Attention will also be devoted to the role of global warming in natural disasters, research regarding causes and effects of "el niño" and "la niña", disaster zones and vulnerable spots in the Himalayas, floods in the Yangtze River area (China) and Eastern India, and the human factor in environmental emergencies.

In addition to the focal theme of the congress, presentations will also be made in the following broad areas:

- hazardous chemicals—waste utilization and pollution minimization
- pollution—water, air, and vehicular
- law and enforcement
- environmental impact assessment and pollution management
- efforts to minimize industries and industrial products that cause pollution and increase greenhouse gases
- research related to theoretical chemistry (inorganic, organic, physical, analytical, instrumentation, pharmaceutical, polymers, etc.)
- research related to drugs, pulp and paper, petrochemicals, oil and natural gas, rubber, paints, textiles, plastics, chemicals, fertilizers, explosives, lubricants, refrigerants, detergents, pesticides, refineries, cosmetics, cement, sugar, distilleries, dyes, electrochemical processes, etc.
- energy, power, renewable and natural energy resources, and thermal and atomic power plants and pollution

For additional information, contact Prof. Dr. Shankar Lal Gargh, Sector A/80, Scheme No. 54, Vijay Nagar, A.B. Road, Indore 452 010 (M.P.), India; E-mail: chemjyot@sancharnet.in or sgargh@yahoo.com; Tel.: +91 731 552837; Fax: +91 731 552966; Web site: http://www.chemenviron.com/.

13th International Symposium on Carotenoids, 6–11 January 2002, Honolulu, Hawaii, USA

This symposium aims to maintain the tradition of an up-to-date survey of progress in all aspects of the carotenoid field. It will provide a forum to report and discuss those areas that are of particular topical interest and where the most significant advances have been made. Presentations are planned by those carotenoid scientists who have made the greatest contributions to these advances.

Plenary lectures will address photosynthesis; new

colorants: from concept to commercialization; carotenoids and photodetection; the Golden Rice Project; carotenoids, vitamin A, and nutrition; carotenoids and muscular degeneration; genetic engineering of plants for carotenoid content; genetic manipulation of plants; and carotenoid modulation of drug-metabolizing enzymes.

Approximately 250–300 scientific participants from around the world are expected to attend the symposium.

For further information, contact Dr. John S. Bertram, Cancer Research Center, University of Hawaii, 1236 Lauhala Street, Honolulu, Hawaii 96813, USA; E-mail: John@crch.hawaii.edu; Tel.: +1 808 586 2757; Fax: +1 808 586 2970.

2nd IUPAC Workshop on Advanced Materials (WAM II): Nanostructured Advanced Materials, 13–16 February 2002, Bangalore, India

This workshop aims to address recent developments in the following areas:

- quantum structures, including nanocrystals of metals and semiconductors
- mesoscalar assemblies
- nanotubes and nanowires
- nanosensors
- nanodevices
- theoretical and computational studies

Leading experts will discuss various aspects of nanomaterials research. In addition to plenary and invited lectures, there will be poster sessions for presenting recent results. Participation is sought from Ph.D. students, postdoctoral fellows, teachers, and scientists. A limited number of travel grants will be available for deserving applicants; the last date for application is 1 October 2001.

A Special Topic Issue of *Pure and Applied Chemistry (PAC)* on the Theme of Nanostructured Systems was published last year (*PAC*, Vol. 72, Nos. 1–2, 2000) after WAM I (held 14–18 July 1999 in Hong Kong), and a similar Special Topic Issue of *PAC* is anticipated to result from WAM II.

For more information, contact Dr. G. U. Kulkarni (Convenor, WAM II), Chemistry and Physics of Materials Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur P.O., Bangalore 560 064, India; E-mail: wam@jncasr.ac.in; Web site: http://www.jncasr.ac.in/wam/.

8th Ibn Sina Conference of Heterocyclic Chemistry, 16–19 February 2002, Luxor, Egypt

This conference will cover recent advances in heterocyclic chemistry in the following areas:

- heterocyclic pharmaceuticals and agrochemicals
- asymmetric synthesis and heterocycles
- organic synthesis
- medicinal and therapeutic chemistry
- inorganic and physical chemistry of heterocycles

For additional information, contact Secretariat, 8th Ibn Sina Conference, c/o Prof. Dr. Hussein El-Kashef, Chemistry Department, Faculty of Science, Assiut University, 71516 Assiut, Egypt; E-mail: ibnsina@aun.eun.eg; Tel.: +20 88 333837; Fax: +20 88 342708.

Functional Foods 2002, 5–7 March 2002, Den Haag, Netherlands

For more information, contact Fiona Angus, Leatherhead Food Research Association, Randalls Road, Leatherhead, Surrey, KT22 7RY, United Kingdom; Tel.: +44 1372 376761; Fax: +44 1372 386228.

3rd Florida Conference on Heterocyclic Chemistry (FloHet-III), 6–8 March 2002, Gainesville, Florida, USA

This aim of this conference is to facilitate the sharing of the best current international work on heterocyclic chemistry between the industrial and academic communities. Heterocyclic chemistry is of immense importance industrially (pharmaceuticals, agrochemicals, etc.), but much basic work is done academically, and the flow of information in both directions is very important.

Approximately 120 scientific participants from around the world are expected to attend this conference.

For further information, contact Prof. Alan R. Katritzky, Department of Chemistry, University of Florida, P.O. Box 117200, Gainesville, Florida 32611-7200, USA; E-mail: katritzky@chem.ufl.edu; Tel.: +1 352 392 0554; Fax: +1 352 392 9199.

8th International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health, 23–26 June 2002, Brescia, Italy

Tentative themes and topics of this meeting are as follows:

- promotion of exchange of experience at international level in development and application of neurobehavioral methods
- use of neurobehavioral methods for assessment of early effects owing to low exposure doses: integration of application in industrialized and developing countries
- assessment of factors not related to exposure and interpretation of possible interactions, especially age and sex

For more information, contact Organizing Secretariat: Simona Galafassi, Institute of Occupational Health, University of Brescia, P.le Spedali Civili 1, 25125 Brescia, Italy; E-mail: medlav@cci.unibs.it; Tel.: +39 030 396496; Fax: +39 030 394902; Web site: http://www.unibs.it/medlav/.

20th International Conference on Organometallic Chemistry (20th ICOMC), 7–12 July 2002, Corfu, Greece

The main purpose of this meeting is to present results of recent research in the area of organometallic chemistry. Themes to be covered will include transition-metal and 4f/5f-metal organometallic compounds, main group organometallic compounds, metal compounds in organic synthesis and catalysis, and organometallics and new materials. These areas have been of interest for several years and are at the forefront of new developments in the fields of new materials, catalysis, "green" chemistry, etc. The meeting will provide a forum for leading scientists in these fields to discuss and present state-of-the-art processes and techniques and for young scientists to widen their knowledge base by contacts with experts.

Approximately 600 scientific participants from around the world are expected to attend this conference.

For further information, contact Dr. Constantinos G. Screttas, National Hellenic Research Foundation, Institute of Organic and Pharmaceutical Chemistry, 48 Vas. Constantinou Avenue, 116 35 Athens, Greece; E-mail: kskretas@eie.gr; Tel.: +30 1 7273876; Fax: +30 1 7273877.

21st Discussion Conference and 9th International ERPOS Conference on Electrical and Related Properties of Polymers and Other Organic Solids, 15–18 July 2002, Prague, Czech Republic

This conference pairing will provide an interdisciplinary forum for scientists working in the fields of low-molecular-weight and polymeric molecular materials with emphasis on their electrical, photoelectric, and optical phenomena. Primary objectives of the meeting are to achieve international cooperation of researchers in academia and industry and to stimulate growth in the field of organic materials for electronics and photonics. Discussions will be focused on novel organic materials and their electrical and related properties. Holding the two conferences together provides a unique opportunity for transferring theories and models developed for perfect molecular crystalline systems to the area of disordered phases and for discussing optical properties, nanotechnologies, and dynamics and kinetics of physical and chemical transformations occurring in these media.

Specific topics for discussion will include molecular model systems: single crystals and highly organized structures; liquid crystals; macromolecules and biomolecules; organic nanocomposites and nanostructures; smart molecules; electrical properties: charge generation and transport, photoconductivity and photovoltaics, electronic processes at interfaces, electroluminescence, and organic conductors and isolators; and optical properties including nonlinear optics and photoinduced processes.

Plenary lectures will address supramolecular materials: toward dynamic conbinatorial materials, photoionization in conjugated polymers, luminescence properties of carbazole and oxadiazole units containing low macromolecular organic compounds, transfer states of organic molecular crystals, and interfacial phenomena in organic polymer films and generation of Maxwell displacement current.

Approximately 120–150 scientific participants from around the world are expected to attend this pair of conferences.

For additional information, contact Prof. Dr. Drahomir Vyprachticky, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovského nám. 2, 162 06 Praha 6, Czech Republic; E-mail: vyprach@imc.cas.cz or sympo@imc.cas.cz; Tel.: +420 2 20403251 or +420 2 20403332; Fax: +420 2 35357981.

17th World Congress of Soil Science (WCCS), 14–21 August 2002, Bangkok, Thailand

This congress has the general theme "Soil Science: Confronting New Realities in the 21st Century". It is being organized jointly by the Soil and Fertilizer Society of Thailand, the International Union of Soil Sciences (IUSS), and the Ministry of Agriculture and Cooperatives (MOAC) of Thailand. The congress venue is the Queen Sirikit National Convention Center.

The 17th WCSS will feature symposia for commissions on soil physics; soil chemistry; soil biology; soil fertility and plant nutrition; soil genesis, classification, and cartography; soil technology; soil mineralogy; and soil and the environment. The program will also include symposia for subcommissions on salted affected soils, soil micromorphology, soil erosion and soil water management, forest soils, and soil remediation. Working groups will hold symposia on cryosols; world soils and terrain digital data base; soils and global change; land degradation and desertification; interactions of soil minerals with organic components and microorganisms; pedometrics; paleopedology; paddy soils fertility; pedotechnique; remote sensing for soil survey; environmental soil mechanics; soil and groundwater pollution; soil of urban, industrial, traffic, and mining areas; soil organic fertilizers and amendments; soils and geomedicine; international soil convention; and acid sulfate soils. The Standing Committee on Education in Soil Science (CES) will also hold a special symposium.

For more information, contact Secretariat, 17th WCSS Office, Kasetsart University, P.O. Box 1048, Bangkok 10903, Thailand; E-mail: o.sfst@nontri.ku.ac.th; Tel.: +662 9405787 or +662 9405707 8; Fax: +662 9405788; Web site: http://www.17wcss.ku.ac.th/.

Conference Calendar

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

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

2001

IUPAC 41st General Assembly

29 June–8 July 2001
Brisbane, Australia.
IUPAC Secretariat
Tel.: +1 919 485 8700
Fax: +1 919 485 8706
E-mail: secretariat@iupac.org

IUPAC 38th Congress/World Chemistry Congress 2001

1–6 July 2001
Brisbane, Australia.
Congress Secretariat, P.O. Box 177, Red Hill Q 4054, Australia
Tel.: + 61 7 3368 2644
Fax: + 61 7 3369 3731
E-mail: wcc2001@ccm.com.au

Coordination and Organometallic Chemistry of Germanium, Tin, and Lead

8–12 July 2001
10th International Conference on the Coordination and Organometallic Chemistry of Germanium, Tin, and Lead, Talence, France.
Dr. B. Jousseaume, Laboratoire de Chimie Organique et Organometallique, UMR 5802, Universite Bordeaux 1, 351 avenue de la Liberation, F-33405 Talence Cedex, France
Tel.: +33 (0) 5 56 84 64 43
Fax: +33 (0) 5 59 84 69 94
E-mail: b.jousseaume@lcoo.u-bordeaux.fr

Scattering Methods and Polymers

9–12 July 2001
20th Discussion Conference on Scattering Methods for the Investigation of Polymers, Prague, Czech Republic.
Dr. Drahomir Vyprachticky, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovskeho nam. 2, CZ-162 06 Praha 6, Czech Republic
Tel.: +420 2 204 0332
Fax: +420 2 367 981
E-mail: sympo@imc.cas.cz

Plasma Chemistry

9–13 July 2001
15th International Symposium on Plasma Chemistry (ISPC-15), Orléans, France.
Prof. Jean-Michel Pouvesle, Laboratoire GREMI, Université d'Orléans, BP 6744, Orléans Cedex 2, France
Tel.: +33 (0) 2 38417124
Fax: +33 (0) 2 38417154
E-mail: jean-michel.pouvesle@univ-orleans.fr

Polymer Membranes

16–19 July 2001
41st Microsymposium on Polymer Membranes, Prague, Czech Republic.
Dr. Drahomir Vyprachticky,

Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovskeho nam. 2, CZ-162 06 Praha 6, Czech Republic
Tel.: +420 2 204 03332
Fax: +420 2 367 981
E-mail: sympo@imc.cas.cz

Organometallic Chemistry

22–26 July 2001
11th IUPAC International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS 11), Tapei, Taiwan.
Prof. Tien-Yau Luh, Department of Chemistry, National Taiwan University
Tapei 106, Taiwan.
Tel.: +886 2 23636288
Fax.: +886 2 23644971
E-mail: tyluh@ccms.ntu.edu.tw

Phosphorus Chemistry

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

Chemistry and Quality of Life

30 July–4 August 2001
8th International Chemistry Conference in Africa, Dakar, Sénégal.
Prof. Libasse Diop, Faculty of Sciences and Technology, University Cheikh Anta Diop BP 5005, Dakar, Sénégal
Tel.: +221 824 8187
Fax: +221 824 6318
E-mail: libasse@enda.sn

Analytical Sciences

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, Toyko 113-8656, Japan.
Tel.: +81 3 5841 7236 (or 7237)
Fax: +81 3 5841 6037
E-mail: icas2001@laser.t.u-tokyo.ac.jp

Macromolecule–Metal Complexes

19–23 August 2001
9th International Symposium on Macromolecule-Metal Complexes (MMC-9), Brooklyn, New York, USA.
Prof. K. Levon Polymer Research Institute Polytechnic University Brooklyn, NY 11201, USA
Tel.: +1 718 260 3339
Fax: +1 718 260 3125
E-mail: klevon@poly.edu

Solution Chemistry

26–31 August 2001
27th International Conference on Solution Chemistry (27ICSC), Vaals, Netherlands.
Dr. Christian Dux, Conference Secretary of 27th ICSC, Institute of Physical Chemistry, RWTH-Aachen, D-52062, Aachen, Germany
Tel.: +49 241 80 4752 or *+49 241 80 4712*
Fax: +49 241 8888 327 or *+49 241 8888 128*
E-mail: 27icsc@liquid.pc.rwth-aachen.de

Medicinal Chemistry

2–6 September 2001
Hungarian–German–Italian–Polish Joint Meeting on Medicinal Chemistry, Budapest, Hungary.
Dr. Péter Mátyus, Institute of Organic Chemistry Semmelweis University H-1092 Budapest, Hungary
Fax: +36-1-217-0851
E-mail: matypet@szerves.sote.hu

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.

Ionic Polymerization

22–26 October 2001
4th International Symposium on Ionic Polymerization, Crete, Greece.
Dr. Nikos Hadjichristidis, University of Athens, Department of Chemistry, Panepistimiopolis, Zografou, GR-157 71 Athens, Greece
Tel.: +30 1 724 9103
Fax: +30 1 722 1800
E-mail: hadjichristidis@chem.uoa.gr

Biodiversity

3–8 November 2001
3rd IUPAC International Conference on Biodiversity (ICOB-3), Antalya, Turkey.
Prof. B. Sener, Department of Phamocognosy, 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

Polymers

11–15 November 2001
6th Brazilian Polymer Conference / IX International Macromolecular Colloquium, Gramado, RS, Barzil.
Prof. Raquel Santos Mauler, Instituto de Química,

Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, 91501-970 Porto Alegre, RS - Brazil
Tel.: +55 51 3166296
Fax: +55 51 319 1499
E-mail: mauler@if.ufrgs.br

Sweeteners

13–17 November 2001
2nd International Symposium on Sweeteners, Hiroshima-Shi, Japan.
Prof. Kasuo Yamasaki, Institute of Pharmaceutical Sciences, Faculty of Medicine, Hiroshima University Kasumi, Minami-ku, Hiroshima 734-8551, Japan
Tel.: +81 82 257 5285
Fax: +81 82 257 5289
E-mail: yamasaki@pharm.hiroshima-u.ac.jp

2002

Carotenoids NEW

6–11 January 2002
13th International Symposium on Carotenoids, Honolulu, Hawaii, USA.
Dr. John S. Bertram, Cancer Research Center, University of Hawaii, 1236 Lauhala Street, Honolulu, Hawaii 96813, USA
Tel.: +1 808 586 2757
Fax: +1 808 586 2970
E-mail: John@crch.hawaii.edu

Polymer Characterization

7–11 January 2002
10th International Conference on Polymer Characterization (POLYCHAR), Denton, Texas, USA.
Dr. Witold Brostow, Department of Materials Science, University of North Texas, Denton, Texas, 76203-5310 USA
Tel.: + 1 940 565 4358, -3262, or 4337
Fax: +1 940 565 4824
E-mail: brostow@unt.edu or *polychar@marta.phys.unt.edu*

Macromolecules

2–6 February 2002 (*new dates!!*)
5th Annual UNESCO School and South African IUPAC Conference on Macromolecules and Materials Science, Stellenbosch, South Africa.
Prof. R. D. Sanderson, UNESCO Associated Centre for Macromolecules and Materials, Institute for Polymer Science, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa
Tel.: +27 21 808 3172
Fax: +27 21 808 4967
E-mail: rds@maties.sun.ac.za

Bioinformatics

6–8 February 2002
The International Conference on Bioinformatics 2002: North–South Networking, Bangkok, Thailand.
Dr. Prasit Palittapongarnpim, BIOTEC, 15th Fl, Gypsum Metropolitan Tower, 539/2 Sri-Ayudhya Road, Ratchadevi, Bangkok, Thailand
Tel.: +66 2 642532231, ext 228
Fax: +66 2 488304
E-mail: incob@biotec.or.th

Heterocyclic Chemistry

6–8 March 2002 NEW
3rd Florida Conference on Heterocyclic Chemistry (FloHet-III), Gainesville, Florida, USA.
Prof. Alan R. Katritzky, Department of Chemistry, University of Florida, P.O. Box 117200, Gainesville, Florida 32611-7200, USA
Tel.: +1 352 392 0554
Fax: +1 352 392 9199
E-mail: katritzky@chem.ufl.edu

Drug Residue Analysis

4–7 June 2002
4th International Symposium on Hormone and Veterinary Drug Residue Analysis, Antwerp, Belgium.
Prof. C. Van Peteghem, Ghent University, Faculty of Pharmaceutical Sciences, Harelbekestraat 72, B-9000 Gent, Belgium
Tel: +32 9 264 81 15
Fax: +32 9 264 81 99
E-mail: carlos.vanpeteghem@rug.ac.be

Macromolecules

7–12 July 2002
39th International Symposium on Macromolecules - IUPAC World Polymer Congress 2002 (MACRO 2002), Beijing, China.
Prof. Fosong Wang, The Chinese Academy of Sciences, Beijing 100864, China
Tel: +86 10 62563060
Fax: +86 10 62573911
E-mail: fswang@mimi.cnc.ac.cn

Solid-State Chemistry

7–12 July 2002
5th Conference on Solid-State Chemistry (SSC 2002), Bratislava, Slovakia.
Prof. P. Sajgalik, Slovak Academy of Sciences, Dubravska c. Brastislava, SK-842 36 Slovakia
Tel.: +421 7 59410400
Fax: +421 7 59410444
E-mail: ssc2002@savba.sk

Organometallic Chemistry

7–12 July 2002 NEW
20th International Conference on Organometallic Chemistry (20th ICOMC), Corfu, Greece.
Dr. Constantinos G. Screttas, National Hellenic Research Foundation, Institute of Organic and Pharmaceutical Chemistry, 48 Vas. Constantinou Avenue, 116 35 Athens, Greece
Tel.: +30 1 7273876
Fax: +30 1 7273877
E-mail: kskretas@eie.gr

Organic Synthesis

14–19 July 2002
14th International Conference on Organic Synthesis (ICOS-14), Christchurch, New Zealand.
Prof. Margaret A. Brimble, Department of Chemistry,

University of Auckland, 23 Symonds St., Auckland, New Zealand
Tel.: +64 9 373 7599, Ext. 8259
Fax: +64 9 373 7422
E-mail: m.brimble@auckland.ac.nz

Photochemistry

14–19 July 2002
XIX IUPAC Symposium on Photochemistry, Budapest, Hungary.
Prof. H. D. Roth, Rutgers University, Department of Chemistry and Chemical Biology, 610 Taylor Road, New Brunswick, NJ 08854-8087 USA
Tel.: +1 732 445 5664
Fax: +1 732 445 5312
E-mail: roth@rutchem.rutgers.edu

Electrical Properties of Polymers NEW

15–18 July 2002
21st Discussion Conference and 9th International ERPOS Conference on Electrical and Related Properties of Polymers and Other Organic Solids, Prague, Czech Republic.
Prof. Dr. Drahomir Vyprachticky, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovského nám. 2, 162 06 Praha 6, Czech Republic
Tel.: +420 2 20403251 or *+420 2 20403332*
Fax: +420 2 35357981
E-mail: vyprach@imc.cas.cz or *sympo@imc.cas.cz*

Solubility Phenomena

22–26 July 2002
International Symposium on Solubility Phenomena (10th ISSP), Varna, Bulgaria.
Prof. Christo Balarew, Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, BG-Sofia 1040, Bulgaria
Tel.: +359 (2) 9793925
Fax: +359 (2) 705 024
E-mail: balarew@svr.igic.bas.bg

Chemical Thermodynamics

28 July–2 August 2002
17th IUPAC Conference on Chemical Thermodynamics, Rostock, Germany.
Prof. A. Heintz, FB Chemie, Universitat Rostock, Hermannstr. 14, D-18051 Rostock, Germany
Tel.:+49 381 498 1852
Fax: +49 381 498 1854
E-mail: andreas.heintz@chemie.uni-rostock.de

Crop Protection

4–9 August 2002
10th IUPAC International Congress on the Chemistry of Crop Protection (formerly International Congress of Pesticide Chemistry), Basel, Switzerland.
Dr. Bernard Donzel, c/o Novartis CP AG, WRO-1060.3.06, CH-4002 Basel, Switzerland
Tel.: +41 61 697 22 67
Fax : +41 61 697 74 72
E-mail: bernard.donzel@cp.novartis.com

Chemical Education

6–10 August 2002 (*new dates!!*)
17th International Conference on Chemical Education (17th ICCE)—New Strategies for Chemical Education in the New Century, Beijing, China.
Prof. Xibai QIU, 17th ICCE c/o Chinese Chemical Society, P.O. Box 2709 Beijing 100080, China
Tel.: +86 10 62568157, 86 10 62564020
Fax: +86 10 62568157
E-mail: qiuxb@infoc3.icas.ac.cn

Bioorganic Chemistry

11–14 August 2002
6th International Symposium on Bioorganic Chemistry (ISBOC-6), Toronto, Canada.
Dr. Ronald Kluger, Department of Chemistry, University of Toronto, Toronto,Canada M5S 3H6
Tel.: +1 416 978 3582
Fax.: +1 416 978 3482
E-mail: rkluger@chem.utoronto.ca

Polymer Science and Technology

2–5 December 2002
IUPAC Polymer Conference on the Mission and Challenges of Polymer Science and Technology, Kyoto, Japan.
Prof. Seiichi Nakahama, Faculty of Engineering, Tokyo Institute of Technology, 2-12-1 Ohokayama, Meguro-ku, Tokyo 152-8552, Japan
Tel.: +81 3 5734 2138
Fax.: +81 3 5734 2887
E-mail: snakaham@polymer.titech.ac.jp

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.

International Union of Pure and Applied Chemistry

IUPAC

announces the 2002

IUPAC Prize for Young Chemists

The IUPAC Prize for Young Chemists has been established to encourage outstanding **young research scientists** at the beginning of their careers. The prize will be given for the **most outstanding Ph.D. thesis** in the general area of the **chemical sciences**, as described in a 1000-word essay.

Prize USD 1 000 and travel
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Each awardee will be invited to present a poster on his/her research and to participate in a plenary award session.

Call for Nominations
(deadline February 1, 2002)

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please visit the IUPAC web site at **www.iupac.org/news/prize.html**
or contact the IUPAC Secretariat
by e-mail at <secretariat@iupac.org> or by fax: +1 919 485 8706.