IUPAC/UNESCO/UNIDO Safety Program Trains Two Scientists in United States

Dr. Mark C. Cesa (BP Amoco Chemicals, Inc., 150 West Warrenville Road, Mail Station F-7, Naperville, Illinois 60563 USA; E-mail: cesamc@bp.com), Secretary of the IUPAC Committee on Chemistry and Industry (COCI), has submitted the following article:

Introduction

IUPAC Company Associates BP Amoco and Bristol-Myers Squibb recently sponsored visits to the United States by Ms. Esma Toprak, chief chemical engineer at Bogazici University in Istanbul, Turkey, and Prof. Ali A. El-Emam, Dean of the Faculty of Pharmacy at the University of Mansoura in Egypt, for hands-on training as part of the IUPAC/UNESCO/UNIDO Safety Training Program.

While industries in developed countries are introducing sophisticated safety measures covering operational, health, and environmental aspects in close interaction with governments and the public, the gap between developed and developing countries in safety education, research, and implementation of technical measures is widening. The increase in chemical production and consumption in the developing world makes it essential to promote interactions to disseminate state-of-the-art knowledge on safety and environmental protection in chemical production.

Realizing the importance of safety education, guidelines, legislation, and implementation, IUPAC; the United Nations Educational, Scientific, and Cultural Organization (UNESCO); and the United Nations International Development Organization (UNIDO) have come together to develop a joint training program for safety and environmental protection in chemical, pharmaceutical, and biotechnological research and production. The joint IUPAC/UNESCO/UNIDO Safety Training Program allows safety experts from developing countries to learn about safety and environmental protective measures by visiting and working in plants of IUPAC Company Associates in the industrialized world.

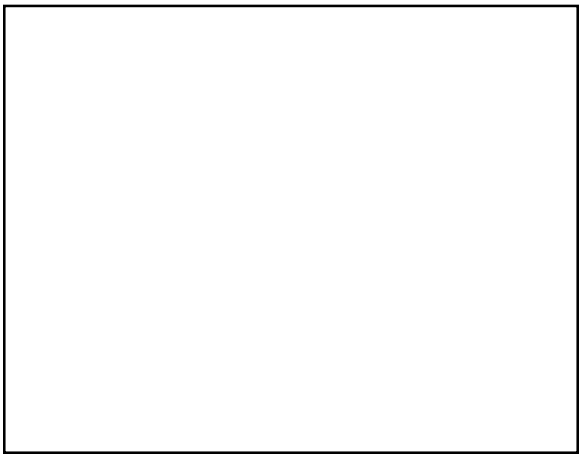
Safety Training Program

The Safety Training Program, established in 1993, is part of a broadly based safety promotion initiative by the IUPAC Committee on Chemistry and Industry (COCI). Training covers such areas as:

- process safety management (PSM)
- environmental protection
- HAZOP/HAZAN analysis
- legislative measures and interaction between industry, universities, government, and the public
- emergency planning and model studies
- "responsible care" and its relevance to developing countries
- integrated approach for safety, health, and environment (SHE) at unit and company levels, and training of university teaching staff in SHE
- ISO 9000 and 14000 series
- material safety data sheets (MSDS)

Ms. Esma Toprak's Visit

Ms. Toprak visited BP Amoco sites in Naperville, Illinois, and Green Lake, Texas, shadowing health, safety, and environment (HSE) and engineering work groups during her two-week stay in April 2000. Her training covered aspects of HSE at the corporate, commercial, and plant levels.



Ms. Esma Toprak

Ms. Toprak was amazed by what she saw, and the devastating Turkish earthquake in August 1999 was never far from her mind. "It was a horrible experience. It makes safety training that much more important." Upon her return home, Ms. Toprak reorganized the student laboratories to comply with international regulations on safety and helped her department review and supplement necessary safety measures and required equipment. Ms. Toprak is also planning to teach courses on safety to students in her department, as well as in other departments and institutions in Turkey.

Prof. El-Emam's Visit

Bristol-Myers Squibb hosted Dr. El-Emam for two weeks in August 2000 at several research and production facilities in New Jersey. Under the supervision of members of the Worldwide Medicine Group, Technical Operations, and Environmental Safety and Health divisions, Dr. El-Emam received training in safety practices in research laboratories, handling of hazardous chemicals, medical surveillance of employees, and crisis management. Among several programs Dr. El-Emam plans to initiate at Mansoura University and elsewhere in Egypt are improvements in safety in teaching laboratories and the establishment of nationwide safety programs through the Egyptian Minister of Environmental Affairs, with seed money provided by UNESCO.

Prof. Ali A. El-Emam

Applications Now Invited for 2001 and 2002

Applications are now invited for placement in the Safety Training Program for 2001 and 2002. Each scientist or engineer accepted into the Safety Training Program is assigned to an IUPAC Company Associate in an industrialized country. The period of training is typically one to three weeks. Accommodation, subsistence, and travel expenses are provided for all trainees.

Candidates successfully completing the Safety Training Program submit a detailed report to the Director of the Program within COCI as well as to the host company, and trainees receive a certificate confirming their participation in the program. Successful candidates will be professional scientists and engineers who are currently

- involved at a supervisory or managerial level in chemical companies, government institutions, or scientific institutions,
- engaged in aspects of safety and environmental protection in chemical, pharmaceutical, or biotechnological production or in the teaching of these fields, and
- have the ability to influence safety practices in their places of employment and elsewhere within their home country.

Application forms can be obtained from the IUPAC COCI Secretary:

Dr. Mark C. Cesa, Secretary, IUPAC Committee on Chemistry and Industry (COCI), BP Amoco Chemicals Inc., 150 West Warrenville Road, Mail Station F-7, Naperville, Illinois 60563, USA, E-mail: cesamc@bp.com

Completed application forms (three copies) should be submitted to the IUPAC COCI Secretary at the above address. For further information on the Safety Training Program, please visit the following web site:

http://www.iupac.org/projects/1993/022_11_93.html

Alternatively, you may contact the following officials of IUPAC, UNESCO, and UNIDO:

Dr. A. Nelson Wright, Chairman, IUPAC Committee on Chemistry and Industry (COCI), 12539 Ranger, Montréal, Québec H4J 2L7, Canada; E-mail: anwright@citenet.net

Dr. Alexander Pokrovsky, Division of Basic Sciences, United Nations Educational, Scientific, and Cultural Organization (UNESCO), 1, rue Miollis, F-75732 Paris Cedex 15, France; E-mail: an.pokrovsky@unesco.org

Risk Assessment Terminology

Dr. John H. Duffus (Director, Edinburgh Centre for Toxicology, 43 Mansionhouse Road, Edinburgh, EH9 2JD, Scotland, UK; E-mail: j.h.duffus@btinternet.com), Chairman of the IUPAC Commission on Toxicology (VII.C.2), has submitted the article that appears below. It is a summary of the main points of a report of the work of a joint International Program on Chemical Safety/Organization for Economic Cooperation and Development (IPCS/OECD) Working Party that was published in 1999 in *Terminology Standardization and Harmonization* (see ref 1).

The problem of "risk" and "hazard" terminology has bedeviled discussions relating to the safe use of chemicals, because there have been different usages, although a consensus is emerging. This paper describes that consensus and how the Working Party identified it. We believe that the chemical community should be aware of the consensus position, and we think that the methodology applied is of considerable interest and agrees with that used by IUPAC terminologists.

Introduction

Recently, because of my IUPAC experience in compiling the "Glossary for Chemists of Terms Used in Toxicology", I was invited to take part in a project with the objective of harmonizing the chemical hazard/risk assessment terminology used by risk assessors. The project was established under the auspices of the Inter-

national Program for the Good Management of Chemicals (IOMC), with the active involvement of the International Program on Chemical Safety (IPCS) and the Organization for Economic Cooperation and Development (OECD). Experts on chemical risk assessment from a variety of backgrounds, including chemistry, biochemistry, pharmaceuticals, toxicology, food safety, environmental sciences, and epidemiology, contributed to the project. Most importantly, the core working group included specialists in terminology, and this composition greatly facilitated its procedures. A full account of the project with detailed annotation has recently been published [2]. This paper presents an outline of the process adopted to identify consensus definitions of the relevant terms and lists the definitions in their current forms. For a thorough discussion, see the full published account [2].

Methodology Used

A joint terminology steering committee (TSC) was established with a balanced representation from the parent organizations to provide guidance and validate proposed approaches *ex ante*. In particular, each member of the TSC had to define the nature and magnitude of the terminological difficulties encountered by their constituency. A smaller terminology planning group (TPG) was established to propose solutions and, once proposals were endorsed, to proceed accordingly.

The work plan was organized in five phases.

1. *Preliminary work*. The members of the TSC were invited to identify, independently and individually:
   a) terms that, in their opinion, should be covered by the project. Terms were eligible for inclusion in the project when differences in usage in various groups were perceived to hamper interdisciplinary cooperation. For practical reasons, it was agreed to limit the initial list to 50 terms;
   b) reference materials, such as glossaries, dictionaries, and other documents which, in their individual opinion, were the most reliable for understanding the meaning of the selected key terms;
   c) peers who would constitute an international reference group (IRG) and participate in a large consultation that would inform the harmonization process.
2. *Priming the process*. Materials received from the TSC members were preprocessed as follows:
   a) An initial cumulative list of more of than the 200 terms was compiled and circulated iteratively to the terminology steering committee for reduction to the agreed level of 50 terms;
   b) All reference materials were screened and all definitions entered in a database for future reference. The database eventually totaled some 5 000 terms and 15 000 definitions;
   c) A survey document was prepared listing the 50 selected key terms in alphabetical order, together with the corresponding definitions collected from the reference materials; the number of definitions per term ranged from 1 to 23, giving a total of 350 in all.
3. *Launching the survey*. A consensus-building exercise was initiated among the 200 peer-nominated experts constituting the IRG. Participants in the survey were invited to indicate, for each of the selected terms, the definition they preferred. Only one choice was permitted. Comments were invited, where necessary, to refine one's opinion on the selected preferred definition. A none-of-the-above option was added to permit rejection of any of the listed definitions; in such a case, comments were mandatory. Survey forms were sent on paper to the participants and made available through the Internet.
4. *Analyzing the data*. Ten thousand records were received, stored in a database, and tabulated. Preferences were counted, and comments were studied. Possible interdisciplinary biases were checked. A detailed report was prepared, giving a snapshot picture of the terminology understanding that emerged from the survey.
5. *Review by the terminology planning group*. A critical review was conducted to assess the conformity of the results arrived at during the analytical process. The outcome of the project, the final list of definitions adopted, is given below.

List of Terms

The terms are not listed here in alphabetical order, because we were dealing with concepts and it was found best to consider each term in the appropriate conceptual environment. We called the base terms "data-oriented terms" and their combinations with action concepts "action-oriented terms".

1. *Data-oriented terms*. "Risk" and "hazard" are the key data-oriented terms, and there are clusters of related terms around them. Others include "guidance value", "margin of exposure", "safety factor", and "threshold".
2. *Action-oriented terms*. These are terms used in conjunction with single-word terms, except for "assessment", which is defined in isolation also.

LIST OF TERMS AND DEFINITIONS

Note: For the purpose of this terminology, the term "agent" refers to any chemical, physical, or biological entity.

SYMBOLS USED

None term from the original list of terms, considered to be a base term

***** term added to the initial list of terms for reasons of consistency

⇨ term intimately related to the preceding base term

γ term loosely related to the preceding base term

HAZARD vs. RISK

hazard: inherent property of an agent or situation capable of having adverse effects on something. Hence, the substance, agent, source of energy, or situation having that property

risk: the probability of adverse effects caused under specified circumstances by an agent in an organism, a population, or an ecological system

DOSE vs. CONCENTRATION

dose: total amount of a substance administered to, taken, or absorbed by an organism

concentration: quantity of a material or substance contained in unit quantity of a given medium or system

EFFECT vs. RESPONSE

effect: change in the state or dynamics of a system caused by the action of an agent

response: change developed in the state or dynamics of a system in reaction to the action of an agent

⇨**adverse effect**: change in morphology, physiology, growth, development, or life span of an organism, which results in an impairment of functional capacity, an impairment of the capacity to compensate for additional stress, or an increase in susceptibility to other environmental influences

⇨**dose–related effect**: change to a system as a function of the quantity of a substance administered, taken, or absorbed by it

⇨**dose–effect relationship**: link between the total amount of a substance administered, taken, or absorbed by a system and the magnitude of a specific, continuously graded change affecting it
Related term: *effect assessment* below

⇨**concentration-effect relationship**: link between the exposure of a given system to a substance over time and the magnitude of a specific, continuously graded change to that system

γ exposure: Concentration, amount, or intensity of a particular agent that reaches a target system. It is usually expressed in numerical terms of substance concentration, duration, frequency, and intensity (after ref. 3)

⇨ **dose–response relationship**: link between the amount of an agent absorbed by a population and the change developed in that population in reaction to it
Note: It may be expressed as the proportion of a population exposed to an agent that shows a specific reaction. It may also be used to signify the magnitude of an effect in one organism (or part of an organism); in that case, it is more specifically called "dose–effect relationship".

⇨**dose–response curve**: graphical presentation of a dose–response relationship

SAFETY AND UNCERTAINTY

safety: practical certainty that adverse effects will not be caused by an agent under defined circumstances.
Note: It is a reciprocal of risk.

⇨**safety factor**: factor by which an observed or estimated toxic concentration or dose is divided to arrive at a criterion or standard that is considered safe

γ uncertainty factor

⇨**margin of exposure**: ratio of the no-observed-adverse-effect level (NOAEL) to the estimated exposure dose (EED) or concentration (EEC)
Note: In the case of environmental risk assessment, predicted environmental concentration (PEC) is used instead of EEC.

uncertainty: imperfect knowledge concerning the present or future state of a system under consideration

ACCEPTABLE DAILY INTAKE

acceptable daily intake: maximum amount of a substance to which a subject may be exposed daily over the subject's lifetime without appreciable health risk

tolerable intake: estimate of the amount of a substance that can be ingested or absorbed over a specified period of time without appreciable health risk

MISCELLANEOUS

guidance value: value, such as concentration in air or water, that is derived after appropriate allocation of the reference dose among the possible media of exposure to assist regulatory authorities in establishing permissible levels of a potential toxicant
Note: "Reference dose" is a term used in the United States for an estimate (with uncertainty spanning perhaps an order of magnitude) of daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime [4].

threshold: dose of a substance or exposure concentration below which a stated effect is not observed or

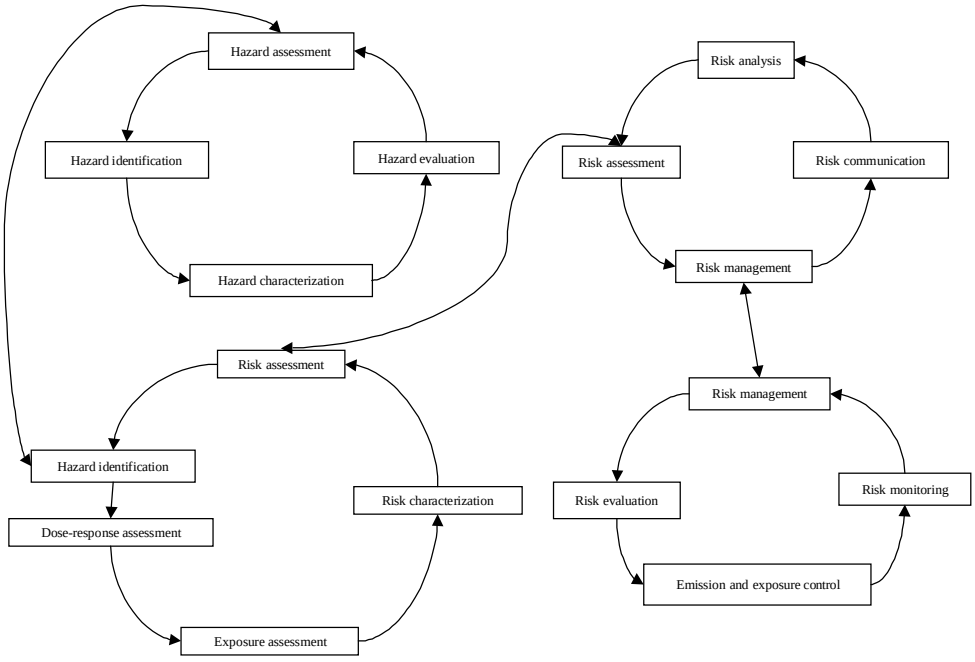


Fig. 1 Hazard/risk assessment concept diagram.

expected to occur

expert judgment: opinion of an authoritative person on a particular subject

toxicity: inherent property of a substance to cause an adverse biological effect

validation: process of assessing whether the predictions or conclusions reached in a risk assessment are correct

ACTION-ORIENTED TERMS

ASSESSMENT VS. ANALYSIS

assessment: combination of analysis of facts and inference of possible consequences concerning a particular object

⇨**assessment endpoint**: quantitative expression of a specific factor with which a risk may be associated as determined through an appropriate risk assessment

⇨**assessment factor**: numerical adjustment used to extrapolate from experimentally determined dose–response relationships to estimate the substance exposure at and above which adverse effects may occur

analysis: detailed examination of anything complex made in order to understand its nature or to determine its essential features

HAZARD ASSESSMENT

hazard assessment: process designed to determine factors contributing to the possible adverse effects of a substance to which a human population or an environmental compartment could be exposed. The process includes three steps: hazard identification, hazard characterization, and hazard evaluation (see Fig. 1).

Note: Factors may include mechanisms of toxicity, dose–effect and dose–response relationships, variations in target susceptibility, etc.

⇨**hazard identification**: [HAZARD ASSESSMENT] the first stage in hazard assessment, consisting of the determination of substances of concern, the adverse effects they may have inherently on target systems under certain conditions of exposure, taking into account toxicity data

Note: Definitions may vary in wording, depending on the context. Thus, here: [risk assessment] the first stage in risk assessment, consisting of the determination of particular hazards a given target system may be exposed to, including attendant toxicity data.

⇨**hazard characterization**: the second step in the process of hazard assessment, consisting in the qualitative and, wherever possible, quantitative description of the nature of the hazard associated with a biological, chemical, or physical agent, based on one or more elements, such as mechanisms of action involved, biological extrapolation, dose–response and dose–effect relationships, and their respective attendant uncertainties

⇨**hazard evaluation**: the third step in the process of hazard assessment aiming at the determination of the qualitative and quantitative relationship between

exposure to a hazard under certain conditions, including attendant uncertainties and the resultant adverse effect

RISK ASSESSMENT

risk assessment: process intended to calculate or estimate the risk for a given target system following exposure to a particular substance, taking into account the inherent characteristics of a substance of concern as well as the characteristics of the specific target system. The process includes four steps: hazard identification, dose–response assessment, exposure assessment, and risk characterization. It is also the first step in risk analysis.

⇨**hazard identification**: [RISK ASSESSMENT] the first stage in risk assessment, consisting of the determination of particular hazards a given target system may be exposed to, including attendant toxicity data

Note: Definition may vary depending on the context. Thus, here: [hazard assessment] the first stage in hazard assessment, consisting of the determination of substances of concern and the adverse effects they may inherently have on target systems under certain conditions of exposure, taking into account toxicity data.

⇨**dose–response assessment**: the second of four steps in risk assessment, consisting of the analysis of the relationship between the total amount of an agent absorbed by a group of organisms and the changes developed in the group in reaction to the agent, and inferences derived from such an analysis with respect to the entire population

γ **effect assessment**: combination of analysis and inference of possible consequences of the exposure to a particular substance based on knowledge of the *dose–effect relationship* associated with it in a specific target system

⇨**exposure assessment**: [RISK ASSESSMENT] step in the process of *risk assessment*, consisting of a quantitative and qualitative analysis of the presence of an agent (including its derivatives) that may be present in a given environment and the inference of the possible consequences it may have for a given population of particular concern

Note 1: [engineering] determination, through the use of a variety of analytical techniques, of the quantity and fate of a chemical, physical, or biological agent in a medium of concern.

[hazard assessment] process to analyze, using a range of different techniques, the amount of a chemical, physical, or biological agent that could be present in a given medium and the fate of such agent under a number of potential circumstances, and to infer possible consequences for a hypothetical system that could be affected by it.

Note 2: Exposure assessment may imply taking into account duration, frequency, or concentration, including considerations of bioavailability.

γ **exposure scenario**: set of conditions or assumptions about sources, exposure pathways, concentrations of toxic chemicals, and populations (numbers, characteristics, and habits) that aid the investigator in evaluating and quantifying exposure in a given situation [5]

or

set of assumptions concerning how an exposure may take place, including assumptions about the exposure setting, stressor characteristics, and activities that may lead to exposure [1]

γ **fate**: pattern of distribution of a substance, its derivatives, or metabolites in a system of concern as a result of transport, partitioning, transformation, or degradation

⇨**risk characterization**: integration of evidence, reasoning, and conclusions collected in *hazard identification, dose–response assessment,* and *exposure assessment* and the estimation of the probability, including attendant uncertainties, of occurrence of an adverse effect if an agent is administered, taken, or absorbed by a particular organism or population. It is the last step of *risk assessment.*

Note: In ecological risk assessment, *concentration–response assessment is* carried out instead of *dose–response assessment.*

or

qualitative and/or quantitative estimation, including attendant uncertainties, of the severity and probability of occurrence of known and potential adverse effects of a substance in a given population

γ **risk estimation**: quantification of the probability, including attendant uncertainties, that a chemical, physical, or biological agent administered, taken, or absorbed by a system with have a specific effect, based on hazard identification, dose–response assessment, and exposure assessment for that particular agent in relation to that particular system

γ **acceptable risk**: type of risk such that the benefits derived by an organism, a population, or an ecological system outweigh the adverse effects that might affect them as a result of being administered or exposed to a particular agent

RISK MANAGEMENT

risk management: decision-making process involving considerations of political, social, economic, and technical factors with relevant risk assessment information relating to a hazard so as to develop, analyze, and compare regulatory and nonregulatory options and to select and implement the optimal decisions and actions for safety from that hazard. Essentially, risk management is the combination of

three steps: risk evaluation, emission and exposure control, and risk monitoring.

Note: The intermediate step (emission and exposure control) was not listed in the survey, but is included here for the sake of consistency. Control is used here in a general rather than specific regulatory sense.

⇨**risk evaluation**: establishment of a qualitative or quantitative relationship between risks and benefits, involving the complex process of determining the significance of the identified hazards and estimated risks to those organisms or people concerned with or affected by them. It is the first step in risk management.

Note: It is synonymous with *risk–benefit evaluation.*

⇨**risk monitoring***:* process of following up the decisions and actions within risk management in order to ascertain that risk containment or reduction with respect to a particular hazard is assured

RISK ANALYSIS

risk analysis: process for controlling situations where populations or ecological systems could be exposed to a hazard. It usually comprises three steps, namely risk assessment, risk management, and risk communication.

⇨**risk assessment**: process intended to calculate or estimate the risk for a given target system to be affected by a particular substance, taking into account the inherent characteristics of the substance of concern as well as the characteristics of the specific target system. The process includes four steps: hazard identification, dose–response assessment, exposure assessment, and risk characterization.

⇨**risk management**: decision-making process involving considerations of political, social, economic, and technical factors with relevant risk assessment information relating to a hazard so as to develop, analyze, and compare regulatory and nonregulatory options, and to select and implement the optimal response for safety from that hazard. Essentially, risk management is the combination of three steps: risk evaluation, emission and exposure control, and risk monitoring.

Note: The intermediate step (emission and exposure control) was not listed in the survey, but is included here for the sake of consistency.

⇨**risk communication**: interactive exchange of information about risks among risk assessors, managers, news media, interested groups, and the general public

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Medicinal Chemistry in the Development of Societies, Biodiversity, and Natural Products

Prof. Antonio Monge-Vega (Centro de Investigación en Farmacobiología Aplicada, Universidad de Navarra, 31080, Pamplona, Spain; E-mail: cifa@unav.es), Chairman of the IUPAC Chemistry and Human Health Division Commission on Training and Development (VII.M.2) and Member of the Project Teams on Medicinal Chemistry Curriculum, Guidelines for Natural Product Collaborations, and Training and Research in Medicinal Chemistry in Developing Countries, contributed the following article in collaboration with the coauthors listed below.

This overview represents IUPAC's efforts to develop an awareness of the state of medicinal chemistry in different geographic areas of the world and a proposal to achieve more effective international cooperation.

Introduction

Modern times have seen globalization of all human endeavors accompanied by a seamless, *sans frontières*, diffusion of culture, ideas, and science across traditional boundaries of territories, cultures, and societies. However, all societies are not at the same level of development, and a significant challenge still lies ahead in respecting and harnessing our differences to ensure peace, justice, and liberty for all.

For example, within the context of the life sciences, a man-made medicinal agent should receive special, international attention. Any compound that can help restore lost health or prevent a disease should be made available to all countries, regardless of the continental location or the degree of societal development. The only limits that should exist are those that are organizational, linked to preparation, distribution, etc.

Currently, there are countries that are the discoverers of medicinal agents, and there are countries that are simply consumers. Likewise, there are countries whose legislation pertaining to intellectual property rights is quite sophisticated, while there are others who do not have this type of legislation at all. Some countries are in search of development with an overabundance of

natural resources and biodiversity, while others have the potential for scientific and technological exploitation, but lack such resources. In this wide panorama, the field of chemistry can play an important role, because medicinal agents are chemical products that, in many cases, are often modified—if not entirely prepared—by chemical reactions. Likewise, biodiversity is attributable to chemical constituents of plants with an array of complex structures, many of which have not yet succumbed to total, practical syntheses by man. To lose biodiversity is to lose information of great potential value.

This article intends to refine and further promote ideas proposed during earlier projects of the IUPAC Medicinal Chemistry Section (VII.M) [1–3]. Specifically, the authors seek to enhance the transfer of science and technology associated with drug discovery and development between developed and developing societies in the most mutually beneficial scenarios possible.

Inverting the Model

Regardless of administrative or political considerations, companies and centers having high levels of development need to be brought together with those that lack it by means of joint projects within the broad field of chemistry and, especially, within the distinct area of biologically active compounds. Various modes of interaction can be proposed; the most often used is one wherein samples of materials from developing countries with biodiversity are extracted and transported for study in developed societies. We make a case for an *inversion of this traditional model*, namely, that of offering technology to the countries with biodiversity so that they themselves may carry out the necessary developmental work. Chemical research conducted in the country where samples originate would enhance that country's scientific development. Competitive capacity, research methodology, and infrastructure could be the focus of negotiation and agreement. Contributions to chemical research on bioactive molecules that biodiversity-rich, developing countries then may be able to return can be ascertained on the basis of:

Strengths:

- Biological material, both of animal and vegetable origin, with demonstrated or potential activity
- Traditional knowledge concerning biological activities, linked to plants or animals

Weaknesses:

- Infrastructure deficiencies that cause difficulties for conducting scientific research

Salient features of such programs should provide for conservation of biodiversity, equitable intellectual property rights/duties, and development of scientific resources/facilities/infrastructure.

Medicinal Chemistry and Biodiversity

Realizing that biodiversity can be lost by man-made cataclysms such as the construction of large public works or by natural catastrophes such as fires, volcanoes etc., *medicinal chemistry can function as a great ally* by emphasizing the ecobalance between life and its surroundings, plants and microfauna, and other relationships. *Medicinal chemistry also recognizes the symbiotic interaction between native communities and cultures as a foundation and wellspring for potential discoveries.* These interrelationships must be nurtured, and their key elements preserved. Researchers studying natural medicinal agents subscribe to this rationale. Their analysis, evaluation, and effective utilization of available resources can greatly assist in maintaining the elements of biodiversity while promoting scientific advances. Alternatively, in developing countries whose economies are based on the exploitation of agricultural and livestock resources principally geared to the production of cash crops and immediate products, there is great pressure on their natural space. Consequently, there is also great pressure toward the potential elimination of their natural flora. Thus, the relationships between biodiversity, opportunity, and the structuring of various alliances become especially important relative to the immediate financial needs of a developing country. In this light, however, *biodiversity and medicinal chemistry must find a way to collaborate and optimize opportunities based on new alliances and technology transfer that is not based upon pure economics. Enormous benefits can accrue in the fields of education, scientific research, and innovation when an approach other than immediate financial gain is taken.*

Some examples can be illustrative. The "uña de gato," *Uncaria tomentosa,* DC, is a liana which has long been used by native communities of South America. However, the people from the countries where the plant grows became wary of exporting extracts for medicinal chemistry research because they thought they might not receive commensurate benefits. Ultimately, the plant became offered on the Internet in any quantity anywhere in the world by a few financially opportunistic companies. The result is that the opportunity for incorporating technology and technological development for the countries that originally possessed the plant has been lost. Alternatively, the domestication of plants, such as the *Catharanthus roseus* G. Don of great interest in the production of anticancer alkaloids like vincristine, represents a form of conserving biodiversity, of training in agricultural techniques of economic interest, and of creating a local chemical industry.

Medicinal Chemistry and Ownership of Natural Resources

Recognizing the sovereign rights that each country has over its resources [4], the aim of this report is to prompt compromises between developed countries and developing countries in the area of ownership. New circumstances [5] have emerged that suggest *reform of the traditional system of patents essential for commercialization and diffusion of science.* Currently, when a native community produces a unique cloth, it can be copied by the whole world because it is not legally protected. Alternatively, when an entity in a developed country copies and registers modifications based on the designs of a native community, absolutely no one, not even the original artists, can legally copy them [6]. It could be argued that the native community has the sole responsibility to register its work in order to obtain legal protection. However, such countries are typically unable to do this because of a lack of knowledge regarding these types of procedures or owing to a scarcity of the means to achieve such ends. The same situation can happen with a galenic preparation of a plant that has biological activity when initially used by a traditional culture.

Establishing ownership may not be simple. It is imperative to begin by defining the discoverer [7]. In the discovery of medicinal agents by traditional ways of medicinal chemistry, ownership can correspond to an individual researcher or to an entire research team. For plants with therapeutic applications originating from native communities, the question is much more complicated. Here we are speaking more of a "chain" of inventors. This process can result in problems when it comes to the selection of the beneficiaries and the distribution of the benefits obtained. A matter of equal importance is the fact that certain cultures hold nature to be sacred and look askance at any attempts at its legal protection as a prelude to commercialization.

Whether the traditional use of a plant for a given pathology constitutes public property and prior art is a vexing question. *The protection of knowledge, within the context of plants with biological activity, cannot be easily accomplished via patents, and it becomes necessary to search for further avenues. From the standpoint of equity, answers may be found during the transfer of knowledge.* Consider that the number of plants that are currently used in their original form in therapeutics is quite limited. In practice, it is the process of biodirected fractionation of plant extracts that eventually permits us to find compounds that then typically also undergo further structural modification ultimately to provide preferred molecules that are more active and less toxic. Consequently, in this type of scenario a patent covering the initial plant material may not be adequate. The solution to this scenario of *"plant development" can lead to an impasse precisely for the countries in search of development*, thereby possibly losing by default the possibilities for the use of their biodiversity.

Economic compensation for historical knowledge should not be lost during the overall development process because the living materials may have needed protection and conservation, sometimes throughout centuries, in order ultimately to afford the current validation of their use. This effort might be compensated for through a contract, establishing royalties that could be obtained when commercialization takes place. In line with our previous discussion, the contract might also specify in advance of commercialization and as part of a collaborative development venture, the training of persons and the acquisition of equipment and technologies as well as the more typical payment for samples. For example, compensation could be provided to the persons that provide the plant, make the extracts, and carry out biological assays, in such a way that each one can maintain his or her own interest and ultimate stake in commercialization. The country obtains benefits directly through taxation corresponding to the activities, and more importantly, through the scientific and technological upgrading of its society. The possibility of regional subsidiary or local companies playing a more important role in the transference of research and technology in such collaborative scenarios should also be seriously considered.

In countries with emerging economies, biodiversity and related activities constitute "green gold." For this reason, at times, the governments assume quick, financially driven policies that can sometimes be contrary to ecorelationships. Thus, both parties must be prepared to adopt longer-range planning considerations into their decision-making processes. *Equity and equal opportunity must be given to protect the discoveries made by any society.* This principle of equity can ameliorate any misunderstanding arising out of the actions of medicinal chemists in developed countries in their relationship with their counterparts in developing countries.

Summary

- Medicinal chemistry research on extracts from plants and other living organisms that leads to the discovery of therapeutic agents, can also be an important factor toward maintaining biodiversity.
- Relationships between societies that possess important biodiversity and developed societies that possess advanced technological processes should be based on the principles of equity. Such relationships should operate by means of collaborative contracts that acknowledge progression of scientific research in such a way that the immediate financial aspects are not considered to be of primary interest but rather only a legitimate, longer-term consequence of such partnering [8,9].
- Because all of humanity benefits from the discov-

ery of new drugs, all societies should collaborate in the preservation and evaluation of the areas of great diversity from which such structures might emerge. Such collaboration could be carried out through investments made by pharmaceutical companies to help preserve a particular type of land (e.g., of great biodiversity, of fragile environment, or where promising species *prosper*) and through the promotion of localized searches done in collaborative settings that can allow for both immediate development of identified active substances and sustained cultivation of undefined biodiversity.

Additional Recommendations

- Strengthen international relationships on medicinal chemistry research projects, particularly including countries at different levels of development.
- Utilize university–company relationships within less-developed countries.
- Strengthen international relationships between scientists and the authorities responsible for research in various countries.

This report was prepared for publication by: A. Monge, Centro de Investigación en Farmacobiología Aplicada, Universidad de Navarra, Apdo 177, 31080 Pamplona, España; M. Chorghade, Chorghade Enterprises, 14 Carlson Circle, Natick, Massachusetts 01760-4205, USA; P. W. Erhardt, Center for Drug Design and Development, University of Toledo, College of Pharmacy, 2801 West Bancroft Street, Toledo, Ohio, 43606-3390, USA; C. R. Ganellin, University College London, Department of Chemistry, Christopher Ingold Laboratories, 20 Gordon Street, London, England WC1H OAJ, UK; N. Koga, Daiichi Pharmaceutical Co. Ltd., 14-10 Nihonbashi 3-chome, Chuo-ku, Tokyo 103-8234, Japan; P. Lindberg, Astra Hässle AB, S-431 83 Mölndal, Sweden; T. J. Perun, Route 4, Box 24, Hempstead, Texas 77445, USA; J. G. Topliss, Department of Medicinal Chemistry, University of Michigan, College of Pharmacy 428 Church Street, Ann Arbor, Michigan 48109-1065, USA; B. K. Trivedi, Parke-Davis Pharmaceutical Research, 2800 Plymouth Road, Ann Arbor, Michigan 48105, USA; and C. G. Wermuth, Université Louis Pasteur Strasbourg, Faculté de Pharmacie, 74 Route du Rhin, BP 24, F-67401 Illkirch Cedex, France.

Acknowledgments

The following persons have collaborated in this work: F. Alcudia González, Departamento de Química Orgánica y Farmacéutica, Universidad de Sevilla, 41012 Sevilla, Spain (Red Iberoamericana de Investigación, Diseño y Desarrollo de Medicamentos [RIIDDMED] - CYTED); I. Aldana, Departamento de Química Orgánica, Facultad de Farmacia, Universidad de Navarra, C/ Irunlarrea, s/n, 31008 Pamplona, Spain; M. Benaim, Laboratorios GIEMPI, C/Bolivar, Urb. La Trinidad - Edif. Klinos, Apdo, Postal 87085, Caracas 1081, Venezuela (RIIDDMED - CYTED); H. Cerecetto, Facultad de Química y Ciencias, Universidad de la República, Montevideo, Uruguay (RIIDDMED - CYTED); R. S. Compagnone, Escuela de Química, Facultad de Ciencias, Universidad Central de Venezuela, Apdo, 47102 Caracas, Venzuela (RIIDDMED - CYTED); P. X. Chiriboga, Universidad Central del Ecuador, Facultad de Ciencias químicas, Departamento de Fitoquimica y Productos Naturales, Salazar Gómez No N32 – 01 y Martínez, Mera, Quito, Ecuador (RIIDDMED - CYTED); A. J. Farré, Lab Dr. Esteve, M.D.D.Montserrat 221, 08041 Barcelona, Spain (RIIDDMED - CYTED); M. Fernández Braña, Universidad San Pablo Ceu, Facultad de Ciencias Experimentales, Urb. Montepríncipe, Ctra. Boadilla del Monte 5,300, 28668 Madrid, Spain (RIIDDMED - CYTED); F. Ferrándiz García, Vocal Asesor de Rel. Internacionales, OCYT, C/José Abascal 4, 28003 Madrid, Spain; E. Ferro, Facultad de Ciencias Químicas, Universidad Nacional de Asunción, Faculdad de Ciencias Químicas, Dirección de Investigación, Departamento de Fitoquímica, Campus Universitario, San Lorenzo, Paraguay; J. Fischer, Richter Co., Ltd., P.O. Box 27, H-1475 Budapest 10, Hungary; M. Gattuso, Universidad Nacional de Rosario, Faculdad Ciencias Bioquímicas y Farmacéuticas, Biología Vegetal., Suipacha 531, 2000 Rosario, Argentina; S. Gattuso, Universidad Nacional de Rosario, Faculdad Ciencias Bioquímicas y Farmacéuticas, Biología Vegetal., Suipacha 531, 2000 Rosario, Argentina; S. Guccione, University of Catania (Italy), Dipartimento di Scienze Farmaceutiche, viale A. Doria 6, Ed. 12 Città Universitaria, I-95125 Catania, Italy; P. Huenchuñir Gómez, Facultad de Medicina, Universidad de los Andes, San Carlos de Apoquindo 2200, 6782468 Las Condes, Santiago, Chile (RIIDDMED - CYTED); T. Kobayashi, PhRMA-Japan, SB Building, 6 Sanbancho, Chiyodaku, Tokyo 102-0075, Japan; Y. Martín, Departamento de Química, Universidad Europea de Madrid, Villaviciosa de Odón, 28670 Madrid, Spain (RIIDDMED - CYTED); C. Ochoa de Ocáriz, Instituto de Química Médica, Juan de la Cierva 3, 28006-Madrid, Spain (RIIDDMED - CYTED); B. Sener, Director, Department of Pharmacognosy, Faculty of Pharmacy, Gazi University, P.K. 143, 06572 Mattope, Ankara, Turkey; S. Vega Noverola, Instituto de Química Médica, Juan de la Cierva 3, 28006-Madrid, Spain (RIIDDMED - CYTED); and S. Zacchino, Universidad Nacional de Rosario, Faculdad Ciencias Bioquímicas y Farmacéuticas, Farmacognosia, Suipacha 531, 2000 Rosario, Argentina (RIIDDMED - CYTED).

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Two Routes to Becoming a Medicinal Chemist

Prof. C. Robin Ganellin (University College London, Department of Chemistry, Christopher Ingold Laboratory, 20 Gordon Street, London, England WC1H OAJ, UK; E-mail: c.r.ganellin@ucl.ac.uk), Titular Member of the IUPAC Chemistry and Human Health Division (VII) Committee, President of the Medicinal Chemistry Section (VII.M) Committee, and Titular Member of the Medicinal Chemistry Section Commission on Training and Development (VII.M.2), has submitted the following report:

Introduction

For the purposes of this article and the published references cited at the end, medicinal chemistry is considered in the context of the pharmaceutical industry, where it is concerned with the discovery and synthesis of compounds for biological evaluation as potential new drug therapies. It embraces the identification, design, synthesis, isolation, and chemical characterization of such compounds, the study of structure–activity relationships, and the molecular and physicochemical basis for biological activity.

How to become a medicinal chemist? This question is of interest to many aspiring chemists wishing to become professionally involved in the design and synthesis of potential new drug molecules. The pharmaceutical industry is where most new chemical entities are developed into therapeutic products. It is a major employer of organic and medicinal chemists.

There are two main routes to becoming a medicinal chemist. The most direct is by formal university courses at both undergraduate and postgraduate levels. The less direct and less certain is to train initially as an organic chemist and then join a pharmaceutical company engaged in new drug discovery and learn what is required "on the job". This route may take many years, and the outcome is uncertain. Probably not even the majority of organic chemists following this industrial route to medicinal chemistry will successfully make the transition to becoming a medicinal chemist making decisions about drug design.

View of Big Pharma

A few years ago, the IUPAC Medicinal Chemistry Section (now part of Division VII, Chemistry and Human Health) decided to find out from industry what was their preference for taking on new employees who will become their medicinal chemists. A questionnaire was sent [1] to leading medicinal chemists and research directors in the major international pharmaceutical companies engaged in research and development; their responses were surprisingly similar. Over 90% of the answers indicated that they preferred to take on organic chemists rather than specialists in medicinal chemistry. Some did suggest that it would be helpful for staff to have had some acquaintance with biological subjects such as biochemistry, pharmacology, and physiology [2–4].

It was very strongly stated that the most important educational background required of the new chemists was excellent training in synthetic organic chemistry and that most other necessary skills could be learned on the job. Surprisingly little interest was shown for having chemists with formal academic training in medicinal chemistry, or for chemists trained in organic synthesis but also having significant education in biological subjects.

Clearly, this finding must reflect the view that "if you cannot make the compound, then you cannot test it". However, what the chemist selects to make is also very critical; so, presumably, the opinion must exist that there are already sufficiently experienced medicinal chemists present in the companies to assist new chemists in the selection of target compounds. The balance required between these aspects of expertise and the ease of acquiring expertise is obviously debatable.

Academic Route

Historically, formal university education in medicinal chemistry takes place primarily in faculties or schools of pharmacy. There, medicinal chemistry is only one of a variety of subjects taught at the undergraduate level, where the primary focus is on education for future practicing pharmacists.

Undergraduate medicinal chemistry is usually taught by academic staff (i.e., faculty members) who are practicing medicinal chemists in the sense that they are usually supervising postgraduate students involved in studying a medicinal chemistry topic at research level, often for a Ph.D. requirement, and/or postdoctoral researchers.

It was of interest, therefore, to find out where such academically research-trained medicinal chemists fit into the job spectrum of professionally active medicinal chemists. To this end, a questionnaire was sent to medicinal chemistry professors in faculties or schools of pharmacy in eight countries, including France, Germany, Italy, Japan, Spain, Switzerland, the United Kingdom, and the United States. The questionnaire aimed to elicit information about postgraduate medicinal chemistry students, their courses and training, and the occupations taken up after graduation. The replies representing 109 medicinal chemistry departments or sections have been analyzed, and the results have been published [5–7] to provide a database on modern medicinal chemistry curricula for comparative purposes. The information should help guide discussion of the appropriate paths to be followed by students in preparation for their careers.

The above countries were selected because they have many faculties or schools of pharmacy and a developed pharmaceutical industry with a history of drug discovery. Some other countries with excellent drug discovery traditions, such as Belgium, Denmark, the Netherlands, and Sweden, were not canvassed because they possess few faculties of pharmacy. The questionnaire consisted of 15 main questions and was divided into three sections. The first section was aimed at eliciting information about the composition of the postgraduate student body and the nature of the positions taken by the students after completing their studies. The second section requested information about the faculty staff. The third section asked about student coursework. The reader is referred to the publications for details.

Discussion

It was apparent that the training of medicinal chemists equips them to enter a wide range of occupations. In some of the countries, a substantial proportion of medicinal chemists do continue into synthetic medicinal chemistry. This pathway is especially evident in France, Japan, and the United Kingdom. On the whole, the numbers entering industry also look reasonably healthy and contrast interestingly with the expressed preference for organic chemists received from those with responsibility for hiring in the industry. The gulf between industry and academia as judged by the responses does not appear to be so wide. The impression given by the answers to the questionnaire sent to big pharmaceutical companies was that they were not particularly interested in hiring medicinal chemists. Presumably, fewer medicinal chemists are required to select drug targets and to influence structure–activity analysis in comparison with the number of chemists needed for synthesis who may be working together on a team. In addition, a proportion of the organic chemists will become medicinal chemists by experience "on the job" helped by short courses [8]. Furthermore, many more organic chemists than medicinal chemists are trained in universities; perhaps the ratio is >10:1. So it is easier for companies to find good organic chemists for drug synthesis, in comparison with the relatively few medicinal chemists available.

Big pharmaceutical companies, especially, organize drug discovery in teams of specialists, and they seek the best specialists available. All these factors contribute to create the overall impression that big pharmaceutical companies do not especially seek medicinal chemists for drug discovery. This trend may not apply to the many small pharmaceutical companies engaged in drug research who do not have teams of specialists and who have to rely much more on generalists. The latter may be medicinal chemists who understand organic synthesis but at the same time know how to converse with biochemists, pharmacologists, and other biologists. Possibly, small companies may be where the many trained synthetic medicinal chemists find their employment. In any case, the evidence is that the academic training of medicinal chemists equips them to enter a wide range of occupations—many of which are in industry—and that medicinal chemists are able to find suitable jobs.

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Report on IOCD/IUPAC Workshop on Environmental Analytical Chemistry for Regulatory Chemists and Laboratory Managers, with Emphasis on Mining in Africa, 24–29 September 2000, Potchefstroom, South Africa

Dr. Walter R. Benson (Benson and Associates, 6209 Crathie Lane, Bethesda, MD 20816-1003, USA; E-mail: Wbenson270@aol.com), Cochairman of the IUPAC Chemistry and the Environment Division's Joint Working Party (JWP) with IOCD on Environmental Analytical Chemistry (EAC) in Developing Countries, has submitted the following report:

A Joint IOCD/IUPAC Working Party on Environmental Analytical Chemistry (JWP) was formed by the International Organization for Chemical Sciences in Development (IOCD) and IUPAC in 1993 out of a realization that developing countries need scientists and technical personnel with internationally acceptable expertise and laboratories to perform environmental monitoring. These countries struggle with global trade restrictions, standards, and environmental laws on monitoring of pollutants in air, food, water, and solid wastes, but face a severe lack of trained personnel to manage these tasks. A report on the JWP's previous Czech workshop appeared in *CI*, Vol. 22, No. 2, pp. 34–35 (2000).

The JWP organized this sub-Saharan African workshop in recognition of a growing need in African countries for reliable and verifiable environmental monitoring of agricultural and industrial pollution of air, water, food, and soil. All countries must possess a corps of well-trained regulatory chemists and laboratory managers with capabilities to locate and perform the same official methods of analysis as those used by importers, exporters, and polluting groups (industry, governments, farmers, universities, etc.). As a contribution to sub-Saharan countries, the JWP joined with the South African Chemical Institute (SACI) during their SACI 2000 annual national meeting. Working together with the chairman of the SACI 2000 local organizing committee, Prof. Ernst Breet (Chairman, School of Chemistry and Biochemistry, Potchefstroom University, Potchefstroom 2520, South Africa; E-mail: cheeljb@puknet.puk.ac.za) made our job easier for advertising, invitations, accommodations, financing, contacting speakers, reaching attendees needing financial assistance, social events, transportation, and workshop services. Our objective was to make available to Afri-

Participants in the IOCD/IUPAC Workshop on Environmental Analytical Chemistry for Regulatory Chemists and Laboratory Managers (EAC). Front row, left to right: Dr. Ron Majors, Agilent Technologies; Prof. Jim Navratil, Clemson University; Prof. Ernst Breet, Chairman, South African Chemical Institute (SACI) Organizing Committee; Dr. Walter Benson, Cochair, IOCD/IUPAC JWP EAC Workshop; and Dr. Chrissie Reinecke, Coordinator of SACI 2000, Potchefstroom University and one of the workshop registrants from sub-Saharan Africa. Also shown are Dr. Bruce Rae, President, SACI; Dr. A. Pohland, AOAC International; Prof. Berhanu Abegas, University of Botswana; Dr. Owodo, EPA of Ghana; Profs. Grebreyesus and Retta of Addis Ababa University, Ethiopia; Mr. Othieno, NEM, Uganda; Mr. A. Bera, Minister of the Environment, Madagascar; and Prof. O. C. Othman, Tanzania.

can chemists relevant and up-to-date laboratory techniques, information, and official analytical methods for determining pollutants (e.g., mining waste in drinking water) and for testing products for export (e.g., aflatoxin in peanuts). In addition, we encouraged network formation among the approximately 350 attendees through use of the Internet and the African Association for Pure and Applied Chemistry (AAPAC; see article in *CI*, Vol. 23, No. 1, pp. 19–20, 2001).

Topics and speakers were selected mainly by the JWP, and those not selected to speak were asked to give poster presentations. The workshop covered the following general topics:

- communications and information
- sampling and sample preparation
- air pollution
- water pollution
- laboratory management
- food contamination
- soil pollution

Speakers were assisted through the use of videos on the same topics. Twenty-six papers were presented by nine Americans, one European, and sixteen Africans. A detailed, final report is available from Prof. Breet as an e-mail message and in printed form.

Prof. Jim Navratil (Clemson University, Clemson, South Carolina, USA) gave the plenary lecture for the workshop. It was perfect as an introduction to the talks that followed. Names of workshop speakers with titles of talks, names of participants receiving travel grants without presenting talks, handouts, a list of videos available, a list of poster sessions, an evaluation of the workshop, a description of how this workshop fulfills the goals of IUPAC, acknowledgments, and lists of donors and the members of the JWP are given in the report.

For more information about the SACI 2000 national meeting, addresses of participants, and abstracts of papers and poster sessions, readers should consult the Final Program and Abstracts booklet of the 35th Convention of the South African Chemical Institute, which is available in limited supply from Prof. Breet.

See http://www.iupac.org and http://www.iocd.org for more information and to contribute input on subjects, speakers, needs, and funding.

Report on IUPAC-TACTRI/COA International Workshop on Pesticides 2000: Regulation, Monitoring, and Evaluation, 3–6 October 2000, Taichung, Taiwan

Dr. Kenneth D. Racke (Dow Agro-Sciences, 9330 Zionsville Road, Building 308/2B, Indianapolis, Indiana 46033 USA; E-mail: kracke@dowagro.com), Chairman of the IUPAC Commission on Agrochemicals and the Environment (VI.4), has submitted the following report:

This workshop drew more than 250 participants from 25 countries. Attendees included members of key national research institutes and regulatory agencies, international advisory bodies, agricultural universities, and agrochemical manufacturers. The workshop was planned by the IUPAC Commission on Agrochemicals and the Environment (VI.4) and coorganized by the Taiwan Agricultural Chemicals and Toxic Substances Research Institute (TACTRI) and the Taiwan Council of Agriculture (COA). In addition to sponsorship from IUPAC, TACTRI, and COA, funding was also provided by the Agrochemical Association of Taiwan (AAT). The program for the meeting, which included 26 lectures, 40 posters, and discussion sessions, focused on 3 major topics: pesticide regulation, residue analysis and monitoring, and risk assessment and management. Countries within the Asia-Pacific area participating in the conference face significant challenges in implement-

Participants at the IUPAC-TACTRI/COA International Worskop on Pesticides 2000

ing and refining science-based regulatory systems supporting evaluation and safe use of agrochemicals. The workshop was held at this critical time to highlight international efforts and harmonized approaches being promoted by IUPAC and other international advisory bodies and also to foster dialogue between the key stakeholders within agriculture, government, and the agrochemical industry on future directions. In addition to providing a venue for presentation of the results and recommendations of several recently completed IUPAC projects, several areas of deficiency regarding methodologies were identified as the basis for future project proposals within the Division of Chemistry and the Environment (VI). Conference papers were published in a book of proceedings, and will be available electronically at the TACTRI web site: http://www.tactri.gov.tw/.

Japanese Version of *IUPAC White Book on Chlorine*

IUPAC's Division of Chemistry and the Environment (VI) has prepared a Japanese translation of the Special Issue of *Pure and Applied Chemistry* (*PAC*), Vol. 68, No. 9, 1996, that addressed the continuing debate on the effect of chlorine and chlorine-containing compounds on the environment. The translation effort was coordinated by Dr. Junshi Miyamoto, Past President of IUPAC Division VI. The Special Issue, resulting from the coordination efforts of IUPAC's Committee on Chemistry and Industry (COCI), covers a wide range of scientific aspects and subjects relevant to the issue and provides the background information necessary for informed debate.

The 15-chapter report, *IUPAC White Book on Chlorine*, was prepared for IUPAC by a worldwide network of experts from government and industry. The chapters evaluate critically various aspects of the chlorine issue and are of interest not only to academic institutions, industry, governmental agencies, and environmental organizations, but also to the general public. The effort was led by Project Coordinator Dr. Guy Jean Martens (former COCI member and current IUPAC Finance Committee member) and Dr. René-Paul Martin (former COCI chairman and current Associate Member of IUPAC's Chemistry and the Environment Division (VI) Committee.

The *IUPAC White Book on Chlorine* was the first publication of its type by IUPAC. It is the result of continuous efforts to address issues of societal and industrial concern objectively, involving the chemical sciences. A similar report on environmental oestrogens (endocrine disrupters) was published in September 1998 (*PAC*, Vol. 70, No. 9), and another on oil spill countermeasures technologies and response methods appeared in January 1999 (*PAC*, Vol. 71, No. 1). A Special Topic Issue on the Theme of Nanostructured Systems was published as a double issue for January–February 2000 (*PAC*, Vol. 72, Nos. 1–2). IUPAC's most recent publication of this type appeared as a Special Topic Issue on Green Chemistry in July 2000 (*PAC*, Vol. 72, No. 7).

For further information, visit http://www.iupac.org/publications/pac/special/0996/index.html or contact Dr. Junshi Miyamoto, Division of Chemistry and Environmental Chemicals, Evaluation and Research Institute (CERI), Nikyokan Building, 7th Floor, 1-4-25, Koraku, Bunkyo-ku, Tokyo 112-0004, Japan; E-mail: miyamoto-junshi@cerij.or.jp; Tel.: +81 3 5804 6135; Fax: +81 3 4804 6140.

Reports from IUPAC-Sponsored Symposia

34th International Conference on Coordination Chemistry (34-ICCC), 9–14 July 2000, Edinburgh, Scotland, UK

This meeting, representing the Golden Jubilee of the International Conference on Coordination Chemistry (ICCC) and held at the University of Edinburgh, was attended by approximately 1 300 delegates, from a total of 51 different countries, giving a truly international flavor to the proceedings. Although the weather for the opening ceremony was unseasonably cold and wet (even by Scottish standards!), the hospitality was warm, and all participants were made to feel very welcome.

The lecture rooms and poster areas were located within the buildings of the University of Edinburgh George Square Complex, with the plenary lectures being held in the enormously impressive and atmospheric McEwan Hall. The audiovisual facilities on site were of an excellent standard, and the stewards on duty in the various lecture rooms are to be warmly commended for their helpfulness and their efficiency and skill in keeping everything running smoothly.

The scientific sessions, all with speakers of high quality, were split into six separate themes, comprising Structure and Dynamics, Materials, Biotechnology and Medicine, Technological Advances, Chemistry of Life, and Joe Chatt Chemistry. In all, there were 10 plenary lectures, 234 invited or contributed talks, and 970 poster presentations. All of the sessions were well attended and promoted lively discussions, especially the poster sessions. The plenary lectures were given by Profs. G. J. Leigh (Sussex, England, UK), S. Shinkai (Kyushu, Japan), C. D. Garner (Nottingham, England, UK), J. Reedijk (Leiden, Netherlands), S. B. Wild (Australian National University, Canberra, Australia), M. Poliakoff (Nottingham, England, UK), L. Fabrizzi (Pavia, Italy), H. W. Kroto (Sussex, England, UK), H. Schmidbaur (Munich, Germany), and K. N. Raymond (Berkeley, California, USA). Prof. Reedijk's plenary lecture was the Olivier Kahn Memorial Lecture, and it highlighted the scientific contributions of the late Prof. Kahn. In addition to the wide range of new science being discussed, there was an interesting display of memorabilia from previous ICCC meetings, beginning with the first, held in 1950.

The social program was very well organized, with a wide selection of trips on offer to explore various parts of the delightful Scottish countryside (including, of course, a distillery visit). In addition, there was a welcoming buffet on the opening night of the conference and a memorable wine reception within the battlements of the imposing Edinburgh Castle, with splendid views over the city and its surroundings.

As well as IUPAC sponsorship, the meeting benefited from financial help from Astra-Zeneca, Avecia, Elsevier, EC COST Program, ICI, Infineum, Lancaster, and Unilever. The Royal Society of Chemistry (through the Angela and Tony Fish bequest) and Elsevier were generous in funding student bursaries and support for younger delegates.

Prof. Peter Tasker (Chairman of the Organizing Committee), Prof. Peter Sadler (Chairman of the Scientific Committee), and their colleagues are to be highly commended for producing a conference of the highest quality in terms of the science, the speakers, and the organization.

Dr. J. H. Cameron
Chemistry Department
Heriot-Watt University
Riccarton, Edinburgh
Scotland, United Kingdom

40th Microsymposium on Polymers in Medicine and 59th Prague Meeting on Macromolecules, 17–20 July 2000, Prague, Czech Republic

This 40th Microsymposium was the 59th meeting in the series of Prague Meetings on Macromolecules, organized by the Institute of Macromolecular Chemistry of the Academy of Sciences of the Czech Republic since 1967. With very few exceptions, these meetings have been held under the auspices of IUPAC. The mission of the Prague meetings is to bring together professionals working in a particular topical area of polymer science from all over the world.

The subject of this year's meeting was especially pertinent to the organizing Institute, because its founder, Prof. Otto Wichterle, the inventor of soft contact lenses, was a pioneer in the field of medical applications of polymers. The present microsymposium was held in honor of the 60th birthday of Prof. Jindřich Kopeček, a leader in the area of the application of polymers in controlled drug release, once a graduate student and research fellow at the Institute, and now professor at the University of Utah, Salt Lake City, Utah, USA. Prof. Karel Ulbrich, present Director of the Institute and head of the Czech part of the Prague-Salt Lake City cooperation in polymers for controlled release, chaired the meeting.

The microsymposium was attended by 116 active participants and 22 accompanying persons from 20 countries. Eight main lectures (40 minutes), 21 special lectures (30 minutes), and 58 poster communications were presented. The speakers were recognized experts in the field.

The scope of the meeting comprised tailor-made synthetics of biorecognizable polymers, structural factors influencing the interaction of macromolecules with receptors/antigens, soluble and vesicular drug delivery systems, smart hydrogels in medicine, and genetically engineered biomedical polymers and biomaterials.

A list of the main lectures gives a fair overview of the hot topics of the conference:

- K. Ulbrich *et al*. (Czech Republic), Antibody-targeted polymer carriers of drugs
- S. W. Kim (USA), Novel functional polymers for gene delivery
- K. Kataoka (Japan), Tailor-made block copolymer micelles and nanoparticles for drug delivery
- J. Feijen *et al*. (The Netherlands), Collagen-based biomaterials
- T. Okano *et al*. (Japan), Temperature-responsive intelligent polymers for targeted drug delivery
- D. A. Tirrell (USA), Engineering molecular and cellular recognition in artificial proteins

- R. Duncan *et al*. (UK), Synthetic vectors for intracytoplasmic delivery
- J. A. Hubbell (Switzerland), Degradable and resorbable hydrogels for local delivery and modulation of biological responses

On the last day of the microsymposium, a most stimulating panel discussion on "The future of biomedical polymers" was held, in which J. D. Andrade (USA) served as a skillful moderator. A few problems of a general nature emerged during the discussion, such as interdisciplinary and multidisciplinary education, teamwork, and cooperation between teams.

The social program for active participants included a welcoming reception on the eve of the meeting; a piano recital in the historic Benedictine Archabbey; an afternoon and evening excursion with dinner to a château in the western part of the country and to the brewery museum in the city of Plzen (Pilsen), famous for its superb brands of beer; and a farewell toast. The accompanying persons' program offered sightseeing in the historic parts of Prague and an excursion to the Prague suburbs.

Prof. Pavel Kratochvil
Associate Member, IUPAC Macromolecular Division (IV) Committee
Institute of Macromolecular Chemistry
Academy of Sciences of the Czech Republic
Prague, Czech Republic

18th IUPAC Symposium on Photochemistry, 22–27 July 2000, Dresden, Germany

This interdisciplinary meeting brought together 470 scientists from 40 countries to discuss the most recent advances in the photosciences. Contributions covered a span from applications of photochemistry and photophysics to virtually all areas of fundamental and applied chemistry. The unifying theme of the symposium was the use of photons to initiate reactions and processes of molecules and materials. Topics ranged from photochemistry on the femtosecond time scale to solid-state devices for solar energy storage, from photoprocesses at very low temperatures to atmospheric photochemistry, from photochemical syntheses to photosynthesis, from nanoscale reactors to photosensitive polymers. An atmosphere of *gemütlichkeit* was fostered by the wonderful food for thought...and the excellent beer.

There were 12 plenary lectures; 16 invited lectures; workshops on theoretical organic photochemistry (organized by M. Klessinger), solid-state photochemistry (organized by Miguel Garcia-Garibay), and primary processes in biological photoreceptors (organized by T. Gillbro); 27 short oral presentations; and more than 200 posters. A highlight of the symposium was the presentation of the Porter Award to Vincenzo Balzani of the University of Bologna and his address on some of his recent research in supramolecular photochemistry. The award, for career-long outstanding achievement in the photosciences, is usually presented at the biannual symposium. It is sponsored by the three major photochemical societies (the European Photochemical Association, the Japanese Photochemistry Association, and the Inter-American Photochemical Society). Historical treatises on photochemistry in the 20th century and on the IUPAC Symposia on Photochemistry were presented by Heinz Roth and Kurt Schaffner, respectively.

Much of the credit for the success of the meeting goes to Thomas Wolff, head of the local organizing committee, and his colleagues, Jürgen Fabian, Waldfried Plieth, and Karl Leo, from The Technical University of Dresden, where the symposium was held. The exciting program was set by Silvia Braslavsky, the scientific chairperson, and her international advisory committee.

The 19th Symposium will be held 14–19 July 2002 in Budapest. Its scientific chairperson will be Heinz Roth, and the head of the local organizing committee will be Jòzef Nyitrai. Information can be found on the web site (www.mke.mtesz.hu/iupacp) or by contacting the Hungarian Chemical Society (mail.mke@mtesz.hu). All who attended the 18th Symposium anticipate reuniting in Budapest for the 19th!

Prof. Richard G. Weiss
Chairman, IUPAC Commission on Photochemistry III.3
Department of Chemistry
Georgetown University
Washington, DC, USA

16th IUPAC Conference on Chemical Thermodynamics (ICCT-2000), 6–11 August 2000, Halifax, Nova Scotia, Canada

Often, chemical thermodynamics is seen as an out-of-date branch of science that found its completion long ago. The inaccuracy of that statement was demonstrated at this vigorous conference in Halifax, Nova Scotia. Beginning with the kilted bagpiper greeting the conferees as they entered the first morning, 462 enthusiastic delegates (including 85 students) and an additional 10 exhibitors and 111 accompanying persons enjoyed both challenging developments in modern thermodynamics and traditional Maritime hospitality. The overall participation at the conference was 78% from academia, 14% from industry, and 8% from govern-

ment. Participants came from 40 countries (64 from Canada, 120 from elsewhere in North America, 9 from Central and South America, 150 from Europe, 95 from Asia, 5 from Australia and New Zealand, 11 from Africa, and 8 from the Middle East); the United States had the most participants.

The conference, held at Dalhousie University concurrently with the 55th Calorimetry Conference and the 10th Symposium on Thermodynamics of Nuclear Materials, included 6 plenary lectures [by Prof. Kenneth Marsh, Christchurch, New Zealand (role of reference materials); Prof. Urs von Stockar, Lausanne, Switzerland (driving force for microbial growth—enthalpy- as well as entropy-driven); Prof. John Prausnitz, Berkeley, California, USA (thermodynamics of structured fluids); Prof. Helmut Schwarz, Germany; Michio Yamawaki, Japan; and Frank DiSalvo, USA] and 4 award lectures [Rossini Award (highest international award in chemical thermodynamics), Prof. William Wakeham, London, England, UK (accurate measurements of transport properties of molten metals); Stig Sunner Memorial Award for young outstanding researchers, Prof. Svein Stølen, Oslo, Norway (temperature superconductors and conductor ceramics); Prof. Akira Inaba, Japan; and Hugh M. Huffman Memorial Award of the Calorimetry Conference, Prof. Alexandra Navrotsky, Davis, California, USA (refractory oxides and nitrides)]. In all, there were 16 symposia, covering the following categories: connections between theory and experiment, thermodynamics of materials (6 symposia: battery materials, molecular materials, in honor of P. A. G. O'Hare, pharmaceutical materials, superconductors, and other materials including polymers), nuclear materials, biological thermodynamics, standards (in honor of the 100th anniversary of the National Institute of Standards and Technology, Gaithersburg, Maryland, USA), fluids and fluid mixtures (4 symposia: fluids and solutions under extreme conditions, organized systems and interfaces, fluid-phase equilibria, and other aspects of fluids), other aspects of chemical thermodynamics, and new approaches to thermodynamics education. The education symposium was a new venture for this conference, and it attracted a number of interesting talks concerning lecture demonstrations, as well as posters describing undergraduate laboratory experiments. In addition, there was a preconference one-day short course on thermoanalytical techniques.

In total, there were 527 papers—319 as oral presentations and 208 as poster papers. Based on the number of papers, this conference seems to have been the largest thermodynamics meeting ever held in North America, and almost tied for the largest worldwide (Osaka in 1996 had 529 accepted papers and also more participants). That the meetings taking place in conjunction with ICCT-2000 included the IUPAC Commission on Thermodynamics (I.2; see summary of minutes on pp. 55–57), the Advisory Board of the *Journal of Chemical Thermodynamics*, the Board and Members of the Calorimetry Conference, as well as the workshop on thermoanalytical techniques and a meeting of young thermodynamicists, clearly demonstrates the importance of such a scientific conference as the focal point for a number of international spinoff activities.

Reception at ICCT-2000: Prof. Ron Weir (Chairman of IUPAC's Commission on Thermodynamics I.2), from Royal Military College, Kingston, Canada; Prof. Ken Marsh, New Zealand; Prof. Trevor Letcher, South Africa.

We are grateful to the following exhibitors and other sponsors for their support: 3M Canada (support for materials symposium); Abbott Laboratories (support for pharmaceutical materials symposium); Academic Press (exhibitor and donor of door prizes); AEA Technology (exhibitor); Allied Chemical Technologies (exhibitor); American Chemical Society (exhibitor); Arthur D. Little, Inc. (exhibitor and donor of door prizes); Atlantic Provinces Council on the Sciences; Atomic Energy Canada, Ltd. (support for symposium on thermodynamics of nuclear materials); Bank of Nova Scotia; Begell House, Inc. Publishers (exhibitor and donor of door prizes); B&K Publishing; Brigham Young University, Department of Chemistry and Biochemistry (sponsor of James J. Christensen Memorial Award); BYU DIPPR Thermophysical Properties Laboratory (exhibitor); Canadian Society for Chemistry; Calorimetry Sciences Corporation (exhibitor and sponsor of Hugh M. Huffman Memorial Award); Clearwater Lobster Shops (donor of door prizes); Dalhousie University (sponsor for reception at Monday poster session); Dalhousie University, Department of Chemistry; Department of Tourism and Culture, Province of Nova Scotia; Diagnostic Chemicals; D. B. Robinson & Associates, Ltd (support for symposium on fluids and fluid mixtures); Dow Chemical Company (sponsor of Giauque Student Travel Awards); Educational Innovations, Inc.; Eli Lilly Canada, Inc. (support for symposia on pharmaceutical materials and biothermodynamics); Greater Halifax

Conventions & Meetings Bureau; Halifax Regional Municipality; IUPAC (sponsor of Rossini Award Lecture and donor of door prize); Kluwer Academic Publishers (donor of door prizes); Lord Nelson Hotel; Materials Chemistry Division of the Canadian Society for Chemistry (support for symposium on materials); Mathis Instruments, Ltd. (exhibitor and cosponsor of conference bags); National Institute of Standards and Technology (support for symposia on biothermodynamics, on connections between theory and experiment, and on standards); National Research Council of Canada (sponsor of James A. Morrison Memorial Lecture); NIST Standard Reference Data (exhibitor); Nova Scotian Institute of Science; Ontario Power Generation (support for symposium on thermodynamics of nuclear materials); Oxford University Press (donor of door prizes); Perkin Elmer, Inc. (exhibitor and cosponsor of conference bags); Pharmacia Corp. (support for symposia on biothermodynamics and pharmaceutical materials); Pinter Consulting Services (exhibitor); Physical and Theoretical Division of the Canadian Society for Chemistry (support for symposium on connections between theory and experiment); Prince George Hotel; Sepracor (support for symposium on pharmaceutical materials); Setaram (exhibitor and sponsor of Sunday evening reception); Thermal Hazard Technology (exhibitor); and Thermometric AB (sponsor of Stig Sunner Memorial Award).

In addition to the scientific program, there was an active social program, including a welcoming reception on Sunday evening, a concert of Nova Scotian folk music on Monday evening, and a bus tour of Halifax and Peggy's Cove on Wednesday afternoon, finishing with a tour of the Citadel fortress. The program for accompanying persons also included a double-decker bus tour of Halifax, a visit to Canada's oldest brewery, and tours of the Maritime Museum of the Atlantic and Pier 21 (a historic gateway to North America for European immigration). The lobster banquet on Thursday evening at one of the renovated piers on the Halifax waterfront was a particular highlight for many participants.

All registration and abstract submission for ICCT-2000 was carried out using the conference web site, and all communication was carried out by e-mail. This arrangement worked very well and allowed the paperwork associated with the conference to be handled more efficiently, from acceptance of papers (carried out by the program committee members through the web site), to preparation of conference receipts and name tags.

Margaret Douma (Dalhousie University) served as Conference Assistant, Dr. Peter Kusalik (Dalhousie University) as Conference Secretary and Web Site Manager, Prof. Susan Boyd (Mount St. Vincent University) as Conference Treasurer, Prof. Jan Kwak (Dalhousie University) as Poster and Exhibit Coordinator, Dr. Gerrard Marangoni (St. Francis Xavier University) as Conference Editor for *PAC* manuscripts (which appear in the October 2000 issue, Vol. 72, No. 9), Donna Silvert (Dalhousie University) as Coordinator for the program for accompanying persons, Dr. Richard Verrall (AECL) as Chair of the 10th Symposium on Thermodynamics of Nuclear Materials, Prof. Jadwiga Sipowska (University of Michigan) as Chair of the Calorimetry Conference, and Prof. Mary Anne White (Dalhousie University) as ICCT-2000 Chair. Special thanks are due the International Advisory Committee, the Scientific Program Committee, and many others, especially the members of the White and Kusalik research groups, who helped make this conference a success.

William Wakeham, UK, presenting the Rossini Award Lecture at ICCT-2000.

For further details, including the full program and a list of participants, please see the conference web site (http://is.dal.ca/~icct).

Prof. Mary Anne White
Conference Chair and Associate Member, IUPAC Commission on Thermodynamics I.2
Department of Chemistry
Dalhousie University
Halifax, Nova Scotia, Canada

Prof. Gus Somsen
Official IUPAC Representative to ICCT-2000

New Projects

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

Characterization of Carbon Materials

IUPAC has approved a three-year project to collect a compilation of various national standards for characterization of carbon materials (ASTM, British Standards, AFNOR-France, DIN-Germany, JIS-Japan, ISO, etc.). Although largely similar, the national standards differ in details of determination of properties (e.g., true density, coefficient of thermal expansion, chemical composition, etc.) that are characteristic of given carbon materials or their precursors in production. Such differences often have a marked influence on the characteristic data. These differences frequently cause disagreement in international cooperation for commerce, and a comparison of the various standards can help to recognize the cause of diverging results. An earlier, similar compilation by W. S. Horton (*PAC*, Vol. 51, pp. 1561–1574, 1979) is outdated.

Comments and inquiries from the chemistry community are welcome and should be addressed to the Task Group Chairman, Prof. H.-P. Boehm, Department Chemie, Universität München, Butenandstrasse 5-13 (Haus D), D-81377 München, Germany, Fax: +49 89 2180 7492; E-mail: hpb@cup.uni-muenchen.de.

See http://www.iupac.org/projects/2000/2000-022-1-200.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 *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).

Physical and Biophysical Chemistry Division. Commission on Molecular Structure and Spectroscopy—Provisional Recommendations for NMR Nomenclature: Nuclear Spin Properties and Conventions for Chemical Shifts
<http://www.iupac.org/reports/provisional/abstract01/harris_310801.html>

A unified scale is recommended for reporting the NMR chemical shifts of *all* nuclei relative to the ^{1}H resonance of tetramethylsilane. The unified scale is designed to provide a precise resonance frequency Ξ in a magnetic field in which the ^{1}H resonance of TMS in dilute solution (< 1% by volume) in chloroform is *exactly* 100 MHz. Referencing procedures are discussed, including matters of practical application of the unified scale. Secondary reference samples are recommended for each nucleus, and the relevant values of Ξ are listed, many of which are the results of new measurements.

Some earlier recommendations relating to the reporting of chemical shifts are endorsed, though a minor change to the definition of the δ scale is suggested. Relations between the unified scale and recently published recommendations for referencing in aqueous solutions (for specific use in biochemical work) are mentioned, as well as the special effects of working in the solid state with magic-angle spinning. In all, nine new recommendations relating to chemical shifts are made.

Standardized nuclear spin data are presented in tabular form for the stable (and some unstable) isotopes of all elements with nonzero quantum numbers. The information given includes quantum numbers, isotopic abundances, magnetic moments, magnetogyric ratios, receptivities, and, where appropriate, quadrupole moments and linewidth factors.

Comments by 31 August 2001 to Prof. Robin K. Harris, Department of Chemistry, University of Durham, South Road, Durham, DH1 3LE, England, United Kingdom. Tel.: +44-191-374-3121, Fax: +44-191-386-1127, E-mail: r.k.harris@durham.ac.uk.

Analytical Chemistry Division. Commission on Radiochemistry and Nuclear Techniques—Nomenclature for Isotope, Nuclear, and Radioanalytical Techniques
<http://www.iupac.org/reports/provisional/abstract01/karol_310801.html>

The IUPAC Commission on Radiochemistry and Nuclear Techniques has compiled a glossary on nomenclature for isotope, nuclear, and radioanalytical techniques. The entries in this document originated in two ways. They have either been defined in recent IUPAC sources or, being absent in those sources, are nevertheless thought to be necessary in what would be a comprehensive glossary. The glossary contains more than one thousand terms. Approximately half of these have appeared in none of the previous sources. This situation indicates, at least to a degree, the vitality of developments in the application of nuclear methods to problems of chemical analysis. The intended audience includes experts, novices, occasional users, and developers of potential new techniques or applications.

Comments by 31 August 2001 to Prof. Paul J. Karol, Chemistry Department, Carnegie-Mellon University, 4400 Fifth Avenue, Pittsburgh, Pennsylvania 15213, USA. Tel.: +1-412-268-3142, Fax: +1-412-268-6945, E-mail: pk03@andrew.cmu.edu.

New Books and Publications

New Book from The Royal Society of Chemistry

Principles and Practices of Method Validation. Edited by A. Fajgelj and Á. Ambrus. Hardcover, 2000, x + pp. 1–305. ISBN 0-85404-783-2, GBP 59.50.

This book contains lectures presented at the International Workshop on Principles and Practices of Method Validation, held 4–6 November 1999 in Budapest, Hungary (see report by Dr. Aleš Fajgelj and Dr. Árpád Ambrus in *CI*, Vol. 22, No. 3, pp. 71–73, 2000). The International Association of Official Analytical Chemists (AOAC International), Food and Agriculture Organization (FAO), International Atomic Energy Agency (IAEA), IUPAC, and the Plant Health and Soil Conservation Station of Budapest cooperated in the organization of this event.

Principles and Practices of Method Validation is an overview of the most recent approaches used for method validation in cases where a large number of analytes are determined from a single aliquot and where a large number of samples are to be analyzed. Much of the content relates to the validation of new methods for pesticide residue analysis in foodstuffs and water, but the principles can be applied to similar fields of analysis.

Different chromatographic methods are discussed, including estimation of various effects (e.g., matrix-induced effects and the influence of equipment setup). Methods used for routine purposes and validation of analytical data in the research and development environment are documented.

Legislation covering the EU Guidance on residue analytical methods, an extensive review of existing in-house method validation documentation, and guidelines for single-laboratory validation of analytical methods for trace-level concentrations of organic chemicals are also included. With contributions from experts in the field, any practicing analyst dealing with method validation will find the examples presented in this book to be a useful source of technical information.

The Royal Society of Chemistry is a learned and professional society with a worldwide membership of 46 000. It has as its main objective the advancement of the science of chemistry and its applications, and the maintenance of high standards of competence and integrity among practicing chemists. The society has been involved with the publication of scientific literature since 1841. Surplus cash generated from sales funds the promotion of chemistry.

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

New Book from Elsevier

***Equations of State for Fluids and Fluid Mixtures.* Vol. 5, IUPAC Series on Experimental Thermodynamics. Edited by J. V. Sengers (Institute for Physical Science and Technology and Department of Chemical Engineering, University of Maryland, College Park, MD 20742, USA and Physical and Chemical Properties Division, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA), R. F. Kayser (Technology Services, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA), C. J. Peters (Laboratory of Applied Thermodynamics and Phase Equilibria, Faculty of Applied Sciences, Delft University of Technology, Julianalaan 136, 2628 BL Delft, Netherlands), and H. J. White, Jr. (Institute for Physical Science and Technology and Department of Chemical Engineering, University of Maryland, College Park, MD 20742, USA). Elsevier, Amsterdam, Netherlands (http://www.elsevier.nl). Hardcover, 2000, 928 pages. ISBN 0-444-50384-6, NLG 525.00, Euro 238.23, USD 275.00.**

Contents

This book has been prepared under the auspices of the IUPAC Commission on Thermodynamics (I.2). The authors of the 18 chapters are all recognized experts in the field. The book gives an up-to-date presentation of equations of state for fluids and fluid mixtures. It is intended for postgraduate researchers in the fields of chemical engineering, mechanical engineering, chemistry, and physics.

All principal approaches for developing equations of state are covered. The theoretical basis and practical use of each type of equation is discussed, and the strengths and weaknesses of each are evaluated. Topics addressed include the virial equation of state, cubic equations and generalized van der Waals equations, perturbation theory, integral equations, and corresponding stated and mixing rules. Special attention is also devoted to associating fluids, polydisperse fluids, polymer systems, self-assembled systems, ionic fluids, and fluids near critical points.

New Book from IUPAC

Japanese Translation of *IUPAC White Book on Chlorine.* Special Issue of *Pure and Applied Chemistry* (Vol. 68, No. 9, 1996). Edited by R.-P. Martin and G. J. Martens; Translation coordinated by Junshi Miyamoto. IUPAC (2000), pp. xiv + 1–223. ISBN 4-87326-346-8, JY 8 000.

Please refer to the article under News from IUPAC on page 47 of this issue for details on content of this book and how to obtain a copy of it.

New Publications from AOAC International

***Official Methods of Analysis of AOAC International, 17th Edition.* Edited by William Horwitz. AOAC International (2000). 2 200+ pages, 2 volumes, loose-leaf. 237 illustrations. Indexes. ISBN 0-935584-67-6. USD 799 (print format). Also available in CD-ROM format for PC-compatible or MacIntosh computers. USD 699 (CD-ROM format). USD 999 (print and CD-ROM formats).**

Referred to as the "methods bible" by users worldwide, this compendium is the authoritative source of analytical methods related to foods, drugs, agriculture, and the environment that are used globally by industry, government, and academic laboratories. All methods are validated through the Official Methods℠ program, a rigorous time-tested protocol administered by AOAC International. This 17th edition contains more than 2 700 validated methods adopted by industry, government agencies (many of the methods are cited in the U.S. Code of Federal Regulations), and academic institutions as *de facto* standards in the operation of laboratories and quality assurance processes. The current compilation contains more than 200 new and modifed methods, new safety and quality assurance chapters, and revised guidelines for collaborative study procedures.

It is of particular interest that the term "sample", used in at least 17 different ways in previous editions, is no longer used alone, except in a statistical sense to designate a small portion representing a larger quantity of material. Rather, the terminology recommended by the International Organization for Standardization (IOS) and adopted to analytical work by IUPAC is used. These terms are listed in the introductory section of the compendium, where definitions are included for "laboratory sample", "test (or analytical) sample", "test (or analytical) portion", and "test solution". The term "specimen" is applied if the composition of the material of interest changes with time, as with a flowing river or blood.

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

***Compendium of Microbiological Methods for the Analysis of Food and Agricultural Products.* AOAC International (2000). Available in CD-ROM format only, USD 299.**

This compendium is the first to include all of the microbiological methods used by the premier international organizations for food and agricultural product analysis. It contains 80 AOAC International Official Methods℠, 20 AOAC Research Institute Performance Tested Methods, 15 U.S. Department of Agriculture Food Safety and Inspection Service Laboratory Methods, all of the methods from the U.S. Food and Drug Administration Bacteriological Analytical Manual (BAM) and the "Bad Bug Book", close to 90 methods from the Canadian Health Protection Branch Compendium of Analytical Methods, and some 34 methods from the Campden and Chorleywood Food and Drink Research Association's Manual of Microbiological Methods for the Food and Drinks Industry—in all, over 250 microbiological methods.

***Basic Calculations for Chemical and Biological Analysis, 2nd Edition.* By J. S. Bassey, Efiok and Etim Effiong Eduok. AOAC International (2000). 238 pages. Softbound. Appendixes. ISBN 0-935584-69-2. USD 89.**

This new 2nd edition contains many more practical examples and the following three new chapters: Calculations Involving Chemical Reactions and Stoichiometry, Properties of Gases and Colligative Properties of Solutions, and Analytical Calculations Using Spreadsheets and Reporting Results into Laboratory Information Management Systems. Each chapter includes concise descriptions and definitions for the basic principles, derivation of basic equations or concepts used for calculations, relevant techniques and their applications, and step-by-step examples.

***Quality Assurance Principles for Analytical Laboratories, 3rd Edition.* By Frederick M. Garfield, Eugene Klesta, and Jerry Hirsch. AOAC International (2000). 196 pages. Softbound. Appendixes. ISBN 0-935584-70-6. USD 99.**

This new 3rd edition presents a comprehensive analytical approach to all aspects of quality assurance. New in this edition is recognition of the role of ISO/IEC 17025 as an international laboratory accreditation standard, and the increasing need for laboratories to demonstrate quality performance through external accreditation processes accepted by national accreditation organizations operating within the ISO umbrella.

Reports from Commissions and Division Committees

Commission on Thermodynamics—I.2

Summary of Minutes of Commission Meeting at Halifax, Nova Scotia, 5–6 August 2000

Twenty-two members of the Commission on Thermodynamics (I.2), including national representatives and observers, met for two days of discussions during the 16th IUPAC Conference on Chemical Thermodynamics (ICCT-2000; see conference report on pp. 49–51).

Several projects had been completed and the results published, including the following: *Conductivities, Transference Numbers, and Limiting Ionic Conductivities of Solutions of Aprotic Protophobic Solvents*, by J. Barthel and R. Neueder, II. Carbonates, Dechema Chemistry Data Series, Vol. XII, Part 1d; and *Theory of Equations of State for Fluids and Fluid Mixtures*, edited by J. V. Sengers *et al*. (Elsevier, September 2000; see book announcement on page 54).

In addition, there are several projects that are close to completion. Part 1e in the series *Conductivities, Transference Numbers, and Limiting Ionic Conductivities of Solutions of Aprotic Protophobic Solvents*: III Various Solvents; and Parts 1e: I. Amides and 1f : II. Various Solvents in the series *Conductivities, Transference Numbers, and Limiting Ionic Conductivities of*

Solutions of Protophilic Solvents, by J. Barthel and R. Neueder, are in preparation. A volume on *Vapor Pressures, Osmotic, and Activity Coefficients of Nonaqueous Solutions* is also in preparation. M. A. V. Ribeiro da Silva presented a final draft of Thermochemistry of Chemical Reactions. Publication is planned in the *Journal of Chemical Thermodynamics* and in *Pure and Applied Chemistry (PAC)*, following the IUPAC publication procedure. Changes to the manuscript on "Legendre transforms in chemical thermodynamics" have been agreed upon by Prof. Alberty and Prof. Schiffrin (Commission I.3), and the revised manuscript has been submitted to *PAC* and to the *Journal of Chemical Thermodynamics*. Experimental Thermodynamics Volume VI. *Measurement of the Thermodynamic Properties of Single Phases*, Editors: A. R. H. Goodwin, K. Marsh, and W. A. Wakeham; and Volume VII. *Measurement of the Properties of Multiple Phases*, Editors: T. W. de Loos and R. D. Weir are well advanced. It was anticipated that all sections would be completed by the end of 2000, by which time it was hoped that the problem of finding an alternative publisher to Blackwell Science will have been resolved. I. Wadsö presented a revised manuscript entitled "Standards in Isothermal Microcalorimetery", which will be submitted following the IUPAC procedure for publication. Della Gatta presented his final draft of "Standards for Differential Scanning Calorimetry". After further discussion at the August 2000 ICTAC meeting in Copenhagen, this paper was also to be submitted for publication in the *Journal of Chemical Thermodynamics*, *Thermochimica Acta*, and *Calorimetry and Thermal Analysis*. Possible new projects discussed included "Guidelines for publication of equations of state II. Mixtures" (U. K. Deiters) and "Global phase diagrams of fluid mixtures" (U. K. Deiters and T. M. Boublik).

It was reported that the *Journal of Chemical Thermodynamics* had a steady increase in the number of manuscripts submitted, with 152 papers accepted in 1999 and a journal size of 1 644 pages.

M. A. White announced that there would be more than 500 participants at the 16th IUPAC International Conference on Chemical Thermodynamics (ICCT) to be held 6–11 August 2000 in Halifax, with 120 accompanying persons, from a total of 42 countries and in excess of 500 presentations in 8 parallel oral sessions. The Commission members approved plans for the 17th ICCT, which will be held 28 July–2 August 2002, in Rostock, Germany (see conference announcement in *CI*, Vol. 22, No. 5, p. 156, 2000). The invitation of Prof. Hai-Ke Yan to host the 18th ICCT in Beijing, China 22 –27 August 2004 was officially accepted. A diskette will be prepared to supplement the Guidebook for Organizers of IUPAC ICCTs to assist prospective organizers of these meetings.

The Subcommittee on Thermodynamic Data has been active in the following areas: In the series of publications on *Critical Compilation of Vapor Liquid Critical Properties*, "Part 7. Oxygen Compounds other than Alkanols and Cycloalkanols" has been submitted for publication in the *Journal of Chemical and Engineering Data*. Completion of the work on nitrogen-containing compounds, on halogenated compounds, and on polyfunctional compounds is planned for late 2001. Publication of Vol. 14 (Benzene) and Vol. 15 (Carbon Dioxide) in the series on *International Thermodynamic Tables of the Fluid State* (Project Leader, W. A. Wakeham) is expected in 2001. The first workshop of the project on "Thermochemical, thermodynamic, and transport properties of halogenated alkanes and their mixtures" was very successfully organized by Prof. Matteoli in Pisa 15–18 December 1999 (see report in *CI*, Vol. 22, No. 6, p. 162, 2000). There were 88 participants, with 8 invited lectures, 28 oral, and 34 poster presentations. The scope of this meeting was quite general, with a concluding roundtable discussion to identify the key systems and topics for future work. Eighteen selected papers will be published later this year in a special issue of *Fluid Phase Equilibria*, with Matteoli and Deiters as Guest Editors. The second workshop will be held 9–11 April 2001 in Fontainebleau, France, and will be organized by Dominique Richon (see announcement in *CI*, Vol. 23, No. 1, p. 25, 2001). Selected papers will be published in *Fluid Phase Equilibria*, with J. Dymond and D. Richon as Guest Editors. A. Heintz reported the intention to start a new project on Ionic Liquids (low-temperature organic molten salts). It is proposed to produce a supplement to the two volumes on Heat Capacity of Liquids, published as *Journal of Physical and Chemical Reference Data* Monograph 6 in 1996.

The Subcommittee on Transport Properties met in Boulder, Colorado, USA in June 2000. More than 30 people attended, and there were 8 scientific presentations. The next meeting of the Subcommittee will be held in Thessaloniki, Greece in September 2001.

Under the heading "Definitive correlation of transport properties of fluids", work has been completed on the "Viscosity of toluene at atmospheric pressure/saturation line"; "Viscosity of toluene as a function of pressure"; and "Viscosity of isobutane". Work is continuing on "Viscosity of liquid water"; "Transport properties of methane + ethane"; "Transport properties of butane"; "Viscosity and thermal conductivity of water and steam"; "Viscosity of pentane"; "Viscosity of cyclopentane"; and "Viscosity of alkali chlorides". New subprojects include "Thermal conductivity of isobutane" and "Correlation of thermal conductivity of R134a".

Recent publications under the auspices of the Subcommittee include the following: E. Vogel, C. Kuchenmeister, E. Bich. "Viscosity correlation for

isobutane over wide ranges of the fluid region", *International Journal of Thermophysics* **21**, 343–357 (2000); M. J. Assael, E. Bekou, D. Giakoumakis, D. G. Friend, M. A. Killeen, J. Millat, A. Nagashima. "Experimental data for the viscosity and thermal conductivity of water and steam", *Journal of Physical and Chemical Reference Data* **29**, 141–166 (2000); M. J. Assael, A. Leipertz, E. MacPherson, Y. Nagasaka, C. A. Nieto de Castro, R. A. Perkins, K. Strom, E. Vogel, W. A. Wakeham. "Transport property measurements on the IUPAC sample of R134a", *International Journal of Thermophysics* **21**, 1–22 (2000).

It was agreed to set up a Commission web site to advertise conferences and current projects, to list publications, to provide links to educational tools, to give information on databases, and to provide an opportunity for comment on new proposals and suggestions for feasibility studies.

In order to continue the important work of the Commission after 2001, it was resolved to set up an International Committee on Chemical Thermodynamics (ICCT). It was agreed that:

- The main role of this Committee would be to act as an Advisory Board for the biennial IUPAC International Conference on Chemical Thermodynamics.
- The ICCT would engage in project-based activities. Committee meetings would provide an opportunity for discussion of ongoing projects, of feasibility studies of other proposed projects, and of ideas for new projects.
- The Committee would assume responsibility for and coordinate the activities of the two existing subcommittees of Commission I.2, viz. Thermodynamic Data and Transport Properties.
- The Committee should actively seek to offer its expertise to science and technology. The intention is to approach industry to inform them about the activities of the Committee and to seek funding from companies so that the Committee can be financially independent.
- The membership of the Committee for the period until the 17th ICCT in Rostock, Germany in August 2002, should comprise the present members of Commission I.2, with Prof. R. D. Weir as Chairman and Dr. John Dymond as Secretary.

It was further agreed to approach the Physical Chemistry Division Committee to determine whether the ICCT could become a committee of the Division Committee.

The Chairman thanked all members of the Commission for their contributions and looked forward to the next meeting of the Commission in Brisbane, Australia in June/July 2001. As attendance was expected to be restricted to Titular Members in view of the cost of travel, it was suggested that members of the subcommittees might meet in Europe before the General Assembly.

John Dymond
Secretary, IUPAC Commission on Thermodynamics I.2

Commission on Nomenclature of Inorganic Chemistry—II.2

Summary of Minutes of Commission Meeting at Dublin, Ireland, 19–21 August 2000

As a first order of business, the minutes of the 1999 meeting in Berlin were approved.

Copies of two recent publications were distributed:

"Nomenclature of organometallic compounds of the transition elements (IUPAC Recommendations 1999)", A. Salzer, *Pure Appl. Chem.* **71,** No. 8, 1557–1585 (1999).

"Names for inorganic radicals (IUPAC Recommendations 2000)", W. H. Koppenol, *Pure Appl. Chem.* **72,** No**.** 3, 437–446 (2000).

Two documents by Prof. Koppenol, "Names for muonium ions and radicals (Provisional Recommendation)", *CI*, Vol. 22, No. 4, 114, 2000, and "The naming of new elements", were discussed. The muonium document had been sent to IDCNS and IUPAP and will be submitted to Commission V.7 for comments. The document dealing with the naming of elements will be sent to the Division of Inorganic Chemistry (II) for consultation including external reviews.

A contract for publication of Red Book II has been signed with the Royal Society of Chemistry (RSC). Page proofs are expected in November 2000. Publication is now targeted for 2001.

The principal business of this meeting was to set a firm timetable for Red Book I revision with Prof. N. Connelly as editor. Specific assignments were allocated to Commission members with a deadline set to reply to the editor by 1 January 2001. Several decisions were made regarding rules to be stated in the revised Red Book I. These decisions will be apparent in the full minutes from the Dublin meeting (see posting on the IUPAC web site).

Prof. Connelly is expecting to have a draft document for the next Commission meeting in Brisbane, 30 June–3 July 2001.

The Commission heard a report from Prof. A. Dress on the activities of a group addressing the encoding of molecular structures and the prospects for a unique chemical identifier (IChI). This identifier will most likely be a string of symbols generated by the computer from a connection table. A project entitled "Computer-aided nomenclature for clusters and polyhedra"

was formulated by Prof. Dress during the meeting. This project comes under the IUPAC strategic thrust for development of effective channels of computer-aided communication in the international chemical community. Initially, the project will aim at using descriptors for clusters and polyhedra in the form of alphanumeric strings. The intention is that these methods eventually will merge with Dr. Heller's approach. If funded, this project will commence 1 January 2001 and continue for three years.

The Commission also heard proposals for two other projects: "Organometallics" and "Preferred Names (P-Names)".

The ongoing work in organometallic chemistry will continue with emphasis on metallacycles. The metallacycle working document will be further revised and disseminated to the working party. A new titular member of the Commission, Dr. Alan Hutton, has agreed to assume leadership of a project to produce a separate book on organometallic nomenclature.

A new thrust to devise a list of preferred names for inorganic compounds was initiated. The feasibility of establishing these P-Names will be explored initially in the list of the names of ions and groups that is contained in the 25-page Table VIII in Red Book I. Commission II.2 is ready to work with the Commission on Nomenclature of Organic Chemistry (III.1) and any other Commissions in the area of overlapping entries. In cases where no common agreement can be reached, we plan mutual cross-references.

The Commission heard a presentation from Dr. J. Wisniewski, Senior Developer at MDL and member of Commission III.1. Dr. Wisniewski demonstrated the operation of *Autonom* by drawing a structure of an organic compound and displaying its computer-generated name. At present, the program is based on the 1979 IUPAC rules for naming organic compounds. The demonstration was impressive, but serious limitations were apparent in the version demonstrated. Multiplicative names cannot be generated, symmetrical compounds also fail, and the program is limited to 125 atoms. Dr. Wisniewski also reported that MDL recently acquired a license to use the Gmelin Database of Inorganic Compounds.

The Commission was informed that the IUPAC/IUPAP *Joint Working Party (JWP) on Claims to the Discovery of Elements 110, 111, and 112* has completed its work, and a Technical Report from the JWP will be published in a future issue of *PAC*.

The future of nomenclature activities in inorganic chemistry was discussed. In order to provide continuity of such efforts under the IUPAC reorganization, the Commission members present unanimously supported the idea to keep the Commission together as a group. There was strong sentiment to remain under its former title or receive some equivalent affiliation with the Division of Inorganic Chemistry.

The members were thanked for their efforts and the meeting was adjourned. The next meeting will be held in Brisbane, Australia, 30 June–3 July 2001.

James Casey
IDCNS Representative and Member, IUPAC Commission on Nomenclature of Inorganic Chemistry II.2
Ture Damhus
Secretary, IUPAC Commission on Nomenclature of Inorganic Chemistry II.2

Commission on Photochemistry—III.3

Summary of Minutes of Commission Meeting at Dresden, Germany, 26–27 July 2000

To begin the meeting, the current agenda and the minutes of the 1999 meeting held 8–9 August 1999 in Berlin were approved.

Future of Commission on Photochemistry

At the end of 2001, the IUPAC Commission on Photochemistry (III.3) will cease to exist. National Representatives will also cease to hold positions within IUPAC at this time. Dr. Silvia Braslavsky will continue thereafter as a member of the Organic Chemistry Division (the Division in which Commission III.3 resides). She will be the only member of our community specifically designated to treat issues and projects related to the photosciences within IUPAC.

As a means to ensure the continued active involvement of the photosciences community within IUPAC, to maintain an effective and active dialogue with the greater chemical community that IUPAC encompasses, and to aid Dr. Braslavsky in her efforts to represent the photochemical community's interests within IUPAC, the chairman will invite the three photochemical societies EPA, JPA, and I-APS to establish a formally constituted and charged committee to provide integrated advice and guidance on the state, future direction, and integration of the photosciences. This committee should identify projects for future publications in the IUPAC media and the eminent scientists who could lead such projects.

It is essential that S. Braslavsky be positioned directly under the Bureau to allow interactions with all Divisions of IUPAC. She was to submit a strategic plan to the Bureau in September 2000.

Manuscripts Planned to be Submitted to *Pure and Applied Chemistry*

A paper entitled "Organic photochromism" by Henri Bouas-Laurent and Heinz Dürr will be finalized in the near future to accommodate the comments by the members of the Commission and by the IDCNS (received

after the meeting on August 10) and will be submitted for publication as a Technical Report.

A second draft of a paper entitled "Space- and time-resolved fluorescence spectroscopy and photochemistry" by H. Yoshikawa and H. Masuhara was distributed. Comments by Commission members are to be sent directly to H. Masuhara to reach him until 10 October 2000.

A Technical Report entitled "Figures of merit for the technical development and application of advanced oxidation technologies for both electric- and solar-driven systems" by J. R. Bolton, K. G. Bircher, W. Tumas, and C. A. Tolman is currently being revised after IDCNS review.

A Technical Report by J. R. Bolton on UV disinfection is in preparation.

Projects Inititated or Planned

- A revised critical compilation of actinometry standards, including those in the gas phase and operating in the vacuum ultraviolet region, will be prepared by A. Braun and E. Oliveros, in collaboration with others to be named later.
- D. Phillips (head), Antonio Tedesco, and others to be named later will be asked to write a report on "Photodynamic therapy".
- A report dealing with "Supramolecular photochemistry" will be initiated by V. Ramamurthy (head), V. Balzani, M. Irie, J. Scheffer, and R. G. Weiss.
- A project entitled "Single molecule spectroscopy" led by F. de Schryver has been approved (Project No. 2000-012-1-300).
- An update to the "Glossary of terms used in photochemistry" by J. W. Verhoeven *et al.*, *PAC*, Vol. 68**,** pp. 2223–2286 (1996), will be compiled by A. U. Acuña-Fernandez in collaboration with Silvia Braslavsky and J. R. Bolton. V. Parmon and A. Fujishima may contribute topics related to photocatalysis.
- D. C. Neckers will submit a proposal entitled "Polymer photochemistry".
- Plans to initiate a report on photolithography were abandoned; the frontiers of this research are mostly not in the public domain.
- A suggestion by S. Icli to write a report on "Photochemistry under concentrated sunlight" was discussed. The topic appeared not to be suitable for a Technical Report.

Jakob Wirz
Secretary, IUPAC Commission on Photochemistry
III.3

Conference Announcements

 *designates IUPAC sponsorship*

European Symposium on the Clinical Laboratory and *In Vitro* Diagnostics Industry, 22–23 March 2001, Palma de Mallorca, Spain

The object of this meeting, jointly organized by the Catalan Association of Clinical Laboratory Sciences (ACCLC) and several companies and institutions, is to discuss the scientific interaction between clinical laboratories and the *in vitro* diagnostics industry, with special regard to certification and accreditation of clinical laboratories.

For further information, contact Xaver Fuentes Arderiu, Catalan Institute of Health, Catalonia Spain; E-mail: xfa@csub.scs.es or Style Meetings & Incentives – HOTUSA, Princesa, 58, pral. 08003 Barcelona, Spain; E-mail: convenciones@hotusa.es; Tel.: +34 93 268 10 10; Fax: +34 93 268 35 75.

32nd Conference on Calorimetry and Thermal Analysis (JCAT 32), 12–14 May 2001, Hammamet, Tunisia

This meeting, jointly sponsored by Faculte des Sciences de Tunis, Unité de Thermodynamique Appliquée, and Association Tunisienne des Sciences Biologiques, will focus on calorimetry and thermal analysis in the mineral and petroleum industries, phosphate and hydrocarbon applications, and other selected topics.

For further information, contact Dr. Mohamed Jemal, BP No. 15, 2091 El Menzah 6, Tunisia; E-mail: jemal@planet.tn; Tel.: +216 1 882 200 or +216 1 872 600; Fax: +216 1 885 008 or +216 1 871 666.

21st International Congress of History of Science, 8–14 July 2001, Mexico City, Mexico

Of special interest to chemists at this meeting will be an International Conference of Ecology and Philosophy of Chemistry. Featured topics will include ecology and chemistry; history of chemistry; philosophy of chemistry (language, models, laboratory: instrument-experiment, epistemology, ontology, and ethics); didactics; and theoretical chemistry and general topics.

For additional information, contact Marie de Lurdes Pérez Garrido and Organizing Committee, CIEFIQI, Apartado Postal 19-585, 03910 México D. F., México; E-mail: ciefiqi@hotmail.com; Fax: +52 5 660 32 59.

5th Symposium on the Philosophy of Chemistry and Biochemistry, 6–9 August 2001, Loughborough, Leicestershire, England, UK

This meeting will be held at Loughborough University under the auspices of the International Society for the Philosophy of Chemistry (ISPC). ISPC is devoted to the international exchange of ideas concerning the philosophical foundations of the chemical sciences and related areas. The symposium is intended to foster discourse among chemists, biochemists, philosophers, historians, sociologists, and educators. Members of ISPC can receive the journal *Foundations of Chemistry* at a reduced rate.

For more information, contact Dr. Tony Edmonds, Department of Chemistry, Loughborough University, Loughborough, Leicestershire, LE11 3TU England, United Kingdom; E-mail: t.e.edmonds@lboro.ac.uk; Tel.: +44 1509 222576; Fax: +44 1509 223925.

8th European Symposium on Organic Reactivity (ESOR-8), 1–6 September 2001, Cavtat (Dubrovnik), Croatia

This symposium continues a long and distinguished series of conferences of physical organic chemists, working in all fields of science and its applications, from Europe and the rest of world. Its aim is to provide a forum for the presentation and discussion of recent developments in physical organic chemistry and to highlight future prospects in this mature, but still very active field. The emphasis will be on interdisciplinary approaches encompassing both experimental and theoretical methods, focusing particularly on the following topics: structure and reactivity, proton transfer and electron transfer processes, and supramolecular assemblies and their relevance to molecular biology and materials science. The deadline for submission of abstracts is 1 June 2001.

For additional information, contact ESOR-8 Organizing Committee, c/o Dr. Mirjana Eckert-Maksic, Rudjer Boskovic Institute, POB 180, HR-10 002 Zagreb, Croatia; E-mail: esor@emma.irb.hr; Tel.: +385 1 4680 197; Fax: +385 1 4680 195; Web site: http://www.esor8.irb.hr.

Electronic Structure of Solids and Surfaces—EuroConference on Computer Simulation of Complex Interfaces: Out of the Vacuum into the Real World, 7–12 September 2001, Giens (near Toulon), France

This meeting [supported by the European Commission, Research DG, the Human Potential Program, and High-Level Scientific Conferences (Contract No. HPCF-CT-2000-00231)] focuses on the application of computer simulation, especially first-principles approaches, to the study of real-world surfaces and interfaces—those found outside a vacuum chamber. This topic arises in numerous fields and disciplines, making interdisciplinary participation an integral feature. Bringing together authoritative simulation practitioners, experimentalists, and industrial researchers, the conference will address the scientific and technical challenges that must be overcome in order to advance understanding of complex interfaces.

Key scientific themes of the meeting include the following:

- Interfaces of liquids and solutions with solids: oxides, minerals, metals, and aqueous solutions
- Chemical and mechanical changes at interfaces: oxidation and self-catalysis, lubrication, wear, friction and tribology, corrosion, dissolution, and complexation

The conference is open to researchers worldwide, whether from industry or academia. Emphasis will be on discussion about new developments, and participation will be limited to 100. Grants to cover the conference fee (inclusive of registration, full board, and lodging) will be available, in particular for young nationals (under age 35) from the European Union or Associated States.

For further information, contact Dr. J. Hendekovic, Head of EURESCO Unit, European Science Foundation, 1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France, E-mail: euresco@esf.org; Tel.: +33 388 76 71 35; Fax: +33 388 36 69 87; Web site: http://www.esf.org/euresco.

Workshop on Local and Regional Contribution to Air Pollution and Local Radiative Balance in Asian Developing Countries, 29–31 October 2001, Guangzhou, China

With rapid urbanization and industrialization, many cities in Asia and in developing countries elsewhere suffer from serious air pollution. The problem is considered basically a local urban air pollution problem, but it is also a regional and global matter. This workshop is designed to bring researchers and policy makers together with invited experts to analyze the problem jointly and to determine the extent and influence of regional air pollution on the local problem. A "local" pollutant, fine particles, is getting a lot of attention, not only because aerosols have effects on human health but also because they are an important factor in the local radiative balance. At the end of the workshop, a framework of abatement strategy will be drafted and suggested for decision-makers.

Proposed sessions at the workshop will include discussions of photochemical oxidants (formation, field monitoring, and laboratory simulation and modeling); aerosols (fine particle PM2.5, health implications, regional air pollution, and global changes); and policy (optimized framework of abatement strategy for local and regional air pollution). Organizers of the workshop will include IUPAC's Commission on Atmospheric Chemistry (VI..2), Peking University's Center of Environmental Sciences, the Guangzhou Research Institute of Environmental Protection, and the Netherlands Energy Research Foundation (ECN).

For additional information, contact Mr. Yougqiang Cao, Center of Environmental Sciences, Peking University, Beijing 100871, China; E-mail: yhzhang@ces.pku.edu.cn; Tel.: +86 10 62756592; Fax: +86 10 62751927.

Conference Calendar

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

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

2001

Macromolecules

9–11 April 2001
4th Annual UNESCO School and South African IUPAC Conference on Macromolecules and Materials Science, Johannesburg, 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

Chemistry and Chemical Engineering

16–20 April 2001
IV International Congress on Chemistry and XIII Caribbean Conference on Chemistry and Chemical Engineering, Havana, Cuba.
Prof. Alberto J. Núñez Sellés, Sociedad Cubana de Química, Ave 21&200, Atabey, Apdo. 16042, CP 11600, Havana, Cuba.
Tel.: +537 218 178
Fax: +537 336 471
E-mail: cqf@cqf.co.cu

Free-Radical Polymerization

3–8 June 2001
3rd International Symposium on Free-radical Polymerization: Kinetics and Mechanism, Lucca, Italy.
Prof. M. Buback, Institute for Physical Chemistry, University of Göttingen, Tammannstr. 6, D-37077 Göttingen, Germany
Tel: +49 551 393141
Fax: +49 551 393144
E-mail: mbuback@gwdg.de

CHEMRAWN XIV

9–13 June 2001
Chemrawn Conference—Toward Environmentally Benign Processes and Products, Boulder, Colorado, USA.
Dr. Dennis L. Hjeresen, Environmental Management Program, Los Alamos National Laboratory - Mail Stop J591, Los Alamos, NM 87545.
Tel.: +1 505 665 7251
Fax: + 1 505 665 8118
E-mail: dennish@lanl.gov

High-Temperature Superconductors

24–30 June 2001
6th International Workshop on High-Temperature Superconductors and Novel Inorganic Materials Engineering (MSU-HTSC-VI), Moscow to St. Petersburg, Russia.
Prof. Yu.D. Tretyakov, Chairman, Dr. R.V. Shpanchenko, MSU-HTSC VI Secretary, Department of Chemistry, Moscow State University, Moscow 119899 Russia
Tel.: +7 (095) 939 34 90
Fax: +7 (095) 939 47 88
E-mail: roms@icr.chem.msu.ru

Polymer Dispersions

25–28 June 2001
15th International Conference on Polymers: Preparation of Non-Conventional Polymer Dispersions, Smolenice, Slovak Republic.
Prof. Ignac Capek, Polymer Institute, Slovak Academy of Sciences, SR-842-36 Bratislava, Slovak Republic
Tel.: +421 7 5477 2469
Fax: +421 7 5477 5923
E-mail: upolign@savba.sk

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

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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

Macromolecules–Metal Complexes

19–23 August 2001
9th International Symposium on Macromolecules-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

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

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

6–10 February 2002
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

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

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

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

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

Chemical Education

18–23 August 2002
The 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

Visas

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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