
Environmental Problems of Greece from a Chemical Point of View

Assistant Professor M. Dassenakis (Department of Chemistry, Inorganic and Environmental Chemistry, University of Athens, Panepistimioipolis, Athens 15771, Greece; E-mail: edasenak@atlas.uoa.gr) prepared this article on behalf of the IUPAC Commission on Soil and Water Chemistry (VI.3). We thank the Commission Secretary, Dr. Willie J. G. M. Peijnenburg (E-mail: WJGM.Peijnenburg@rivm.nl), for helping to facilitate publication of this contribution.

General Environmental Characteristics of Greece

Greece, owing to its geomorphology and its fragmented structure, has an extremely wide range of environments with a vast variety of natural conditions, including high mountainous areas as well as subtropical regions. Its mountains, many of which exceed 2 000 m in height, provide all kinds of conditions with a large variety of woods, fields, and rocks; its lowlands include wide river deltas and lagoons. Greece has also many lakes and streams. Some large rivers in northern Greece (the Axios, Strimon, Nestos, and Evros) enter from the Balkan Peninsula, crossing two or more countries.

Greece's total coastline amounts to about 15 000 km (7 300 km continental and 7 700 km islands), and it is the longest in the Mediterranean region. Greece has more than 2 000 islands with rocky or sandy coasts, duns, caves, bushes, and woods, scattered from the North Ionian Sea to the southernmost point of Europe (Gavdos Island) to the easternmost point of Europe (Castellorizon Island). Areas of more than 2 000 m in depth exist in the Greek seas.

Because of such a diversity of microenvironments, the country supports some of the richest floras and faunas in Europe. It contains more than

- 6 000 species of higher plants,
- 110 species of mammals,
- 400 species of birds,
- 100 species of freshwater fish, and
- 60 species of reptiles.

Over the last century, and especially after the 1960s, a significant move of population toward the coastal areas took place as these areas experienced increased economic development, mainly through tourism, industry, transport, and agriculture. This expansion and in-

Millennium Message

Dear Colleagues,

The 20th century has been wonderful and exciting for chemistry and for IUPAC. It is difficult to comprehend the progress that has been made and to appreciate that we now stand within a year or two of seeing the structure of the whole human genome—surely the ultimate achievement in natural product chemistry.

In the 20th century, chemistry came of age, and IUPAC was born and quickly became the world authority on standards, nomenclature, and the validation of essential data for **the** enabling science—chemistry. These developments were made possible only by the hard work of the devoted volunteers who have unselfishly given their support and personal time and efforts since IUPAC was formed.

Now we stand on the threshold of an exciting new period, and when we look at IUPAC, we see an organization that has had the courage to examine what it does and how it does it. The need for change has been seized, but also it has been recognized that many of the founding values still hold true and that several essential activities still require continuity of effort and personnel.

We have broadened our vision and revitalized our purpose so that we face the exciting challenges with confidence and enthusiasm.

I am extremely honored to be the first President in the new millennium, and I wish you every success in your professional activities and you and your families a happy and healthy New Year, Century, and Millennium!

Dr. Alan Hayes, President of IUPAC

tensification of economic development activities has increased environmental problems and threats to Greece's wildlife, leading to a considerable decrease in the number of many species. The most serious threats for the fauna are draining of wetlands, extensive tree cutting, land clearing due to forest fires, development of coastal housing and tourist installations, and construction on mountains. Increased emissions of various kinds of pollutants and pollution of air, water, and soil have also been recognized as significant problems.

Greece's total population is about 10 million. About 89.7% of the population lives in the coastal region, which makes up 76% of the total land area (population density is about 78/km² or 0.6/km of coast). Total population of the coastal cities in Greece is about 7 million, but it increases to more than 10 million during the summer tourism season. Population density in Greece is generally lower than that of North Europe, but it is high in the Attiki and Thessaloniki regions where half of the Greek population is concentrated. The urbanization rate in 1985 was 60%, but it is estimated that by the year 2000 it will be 68%.

Land use by main category in Greece in 1994 was as follows:

Arable land	17 %
Permanent crops	8.2 %
Wooded areas	22.3 %
Permanent grassland	13.6 %
Built-up land	3.7 %
Other areas	35.2 %

Main Problems in the Greek Environment

Environments and ecosystems in Greece are small and fragile and face many problems of various types. Their study, protection, and management according to the principles of sustainability are difficult tasks. Unfortunately, the priorities of a well-documented and low-cost environmental policy have yet to be defined. Social pressures for better environmental quality are still low, although many economic activities are directly dependent on having a cleaner environment.

Although chemists play an important role in the environmental affairs of Greece, there are many problems involved in arranging the cooperation of scientists working in this field. Chemists, biologists, geologists, engineers, etc., each have different scientific approaches and different professional perspectives. There are inevitably conflicts about work responsibilities and distribution of funds that make planning and implementation of environmental policy difficult.

Environmental education of Greek chemists is considered adequate. All undergraduate chemistry department curricula include courses related to the environment, and there are also postgraduate courses. However, the Greek Chemical Society has yet to prove that

it can work effectively in the monitoring, protection, and management of the environment.

Principal environmental problems in fields related to chemistry and chemists are discussed briefly below.

Agriculture

Agriculture is a significant activity in Greece, and increasing quantities of fertilizers and pesticides are consumed as the practices of intensive agriculture are followed by farmers. Greek population employed in agriculture in 1985 was 2 600 000, which, at 26% of the total population, represents the highest percentage in the European Union.

Consumption of pesticides in Greece during 1989 was 7 811 t, but this quantity may have significantly increased since then. Consumption by main category of pesticide in 1989 was as follows:

Fungicides	1 925 t
Herbicides	3 031 t
Insecticides	2 844 t
Other	11 t

Some observations of elevated concentrations of pesticides in plants and animals have been recorded during the last few years, and there are specialized chemical laboratories dealing with the control of the pesticides in agricultural products, but much work remains to be done to establish an effective monitoring system in this field.

Fertilizer consumption for 1994 was 535 000 t (171.3 t/ha/y), broken down as follows:

Nitrogen	334 000 t N
Phosphate	144 000 t P ₂ O ₅
Potash	57 000 t K ₂ O

Significant nitrogen and phosphorus loads are also generated by the livestock population. These loads are estimated to be 145 000 t N and 27 000 t P annually. The quantities that are transferred into the sea are estimated to be 5 000–15 000 t P/y and 30 000–130 000 t N/y.

Intensive agriculture, farming, and municipal wastes are the main causes for the observation of red tides along Greek coasts and for eutrophication of Greek lakes.

The main rivers of the Balkan peninsula discharge their load into the northern section of the Aegean Sea. Their mean discharge is about 1 000 m³/sec, which carries into the sea about 170 000 t N/y, 23 000 t P/y, and 45–60 Mt of suspended sediments/y. Black Sea water, which enters the Aegean Sea through the Dardanelles, also contributes to the enrichment of the Aegean Sea's nutrients.

River outflow has been significantly reduced during the last 20 years because of the construction of hydroelectric dams and the establishment of irrigation systems. Irrigated land has almost doubled in the period 1970–1990; it is now about 30% of the total. The

reduction of the sediment load of the rivers leads to increased beach erosion, to loss of deltaic environments and wetlands, and to changes in offshore profile and shelf transport processes. The inflow of saline water into river beds during the summer and the formation of salt wedges also disturb the estuarine ecosystems.

Soil erosion data for 1987 indicate that this common Mediterranean problem is severe and excessive; over 4 700 000 ha (35.6% of the total Greek land area) and over 800 000 ha of arable land (30% of the total) suffer from soil erosion.

Wastes

Different kinds of solid and liquid wastes pose significant environmental problems in Greece, because there is not a sufficient system for their management. Landfill is the principal treatment for solid wastes, but a large percentage of these wastes are disposed in areas without proper specifications. Many forest fires have been caused because of this practice.

Significant quantities of liquid wastes are also disposed of at sea or in lakes without any pretreatment. These quantities have been reduced during the last few years through the establishment of wastewater treatment plants in many coastal cities.

Waste generation by the industrial sector for 1990 was as follows:

Agriculture	90 000 t
Mining	3 900 000 t
Manufacturing industry	4 300 000 t
Energy production	7 680 000 t

Municipal waste generated during 1992 amounted to 3 200 000 t (310 kg per capita) of the following composition:

Paper and paperboard	20%
Food and garden waste	48%
Plastics	9%
Glass	5%
Metals	5%
Textiles and other	13%

Treatment methods employed for this waste were as follows:

Landfill	2 970 000 t
Recycling (paper and glass)	226 000 t

Production of hazardous waste for 1992 was as follows:

Waste oil	60 000 t
Waste containing PCBs	1 600 t
Clinical and pharmaceutical wastes	15 000 t
Organic solvents	21 000 t
Paints and pigments	6 000 t
Resins and latex	150 t

Municipal wastewater for 1996 ($5.12 \times 10^8 \text{ m}^3/\text{y}$) was disposed of as follows:

Untreated	43.5%
After primary treatment	42.2%
After secondary treatment	14.3%

Into the sea or rivers through

municipal sewer systems	$3.74 \times 10^8 \text{ m}^3/\text{y}$
Onto land	$0.5 \times 10^6 \text{ m}^3/\text{y}$
Into subsoil	$1.36 \times 10^8 \text{ m}^3/\text{y}$
In irrigation ponds	$1.5 \times 10^6 \text{ m}^3/\text{y}$

Air Pollution

Air pollution began to be a problem in Greece after World War II, owing to a burgeoning rate of industrialization, intense urbanization, and economic growth. Problems are greatest in the major cities (Athens, Thessaloniki, Patra, Iraklio, etc.).

Athens has the worst atmospheric pollution problem, mainly because 40% of the population of the country is concentrated there, leading to the existence of a large number of sources in a small area, and because meteorological conditions in the area favor photochemical reactions (air pollution of the Los Angeles type). Some years ago the main sources of air pollution in Athens were industry and central heating, but over the last few years automobile traffic has accounted for most of the air pollution. The absence of an adequate road network and of adequate public transportation creates intense traffic problems; the speed of vehicles is very low in the city center, where the vehicle composition is 80–85% private cars and taxis, 6–10% buses, and 6–14% motorcycles.

Other regions where air pollution has become an important problem are the industrial zone of Elefsis (near Athens) and the zones of Ptolemais (in Macedonia) and Megalopoli (in Peloponesos), where the main power plants of the country that use lignite as a fuel are located.

In Greece, total energy production is 24 000 000 t oil equivalent, derived from the following sources:

Lignite	35%
Petroleum	60%
Other	5%

Total renewable energy is 1 700 000 t oil equivalent, and hydroelectric energy is 220 000 t oil equivalent.

Another point that must be taken into account in Greece is the possible influence of the greenhouse effect and the world climate change on the coastal zone. It is possible that the islands and coasts could be dangerously threatened by the elevation of the sea level. Emissions of greenhouse gases in Greece are rather

Table 1. Pollutant Emissions in Greece

	SO ₂	NO ₂	NMVOC	CH ₄	CO	CO ₂	N ₂ O	NH ₃
Public power	329.4	111.5	1	1	6	50 734	6,891	0
Commercial combustion	37.8	1.4	0	0	1	1 959	417	0
Industrial combustion	26.8	2.6	0	0	0	1 392	98	0
Production processes	50.6	33.6	22	1	25	8 116	2 720	10 558
Extraction–distribution of fuels	0	0	4	364	0	0	0	0
Solvent use	0	0	82	0	0	0	0	0
Road transport	13.4	113.9	137	4	704	10 358	342	139
Other mobile sources	182.2	272.4	47	1	66	1 217	439	0
Waste treatment–disposal	0	0	0	202	0	606	0	0
Agriculture	0	7.4	32	363	341	1	12 716	460 601
Nature	0.9	1.1	393	4 572	0	7 241	181 604	0
Total	641.2	543.9	718	5 508	1 143	81 804	205 227	471 298

small compared to those in North Europe, but they are still a worldwide problem.

Table 1 shows pollutant emissions in Greece by source.

Air pollution is also correlated to the destruction of forests, mainly by fires. Forest fires annually destroy areas that range from 25 000–120 000 ha, while reforestation hardly covers areas more than 5 000 ha per year. The consequences can now be seen, and many people are becoming aware of the extent of the problem, especially since fires in recent years (1998 included) have threatened large urban areas. Unfortunately, most fires are caused by arson; only a few can be traced to natural causes. Although there is a strict policy of vigilance to prevent arson, the ecological damage stemming from forest fires continues to be very high.

Marine Pollution

The significance of the marine environment is obvious in a country like Greece. Most of the environmental problems of the Greek seas are concentrated close to the large cities. Many facilities scheduled for pollution control have either been delayed or ineffectively designed. As a result, in many areas the levels of heavy metals, organic pollutants, and nutrient concentrations are quite high. Many semi-enclosed gulfs suffer seasonally from eutrophication and anoxic conditions, and oil spills and litter have frequently despoiled Greek beaches in recent years.

During a typical year (1995), there are records of about 300 pollution events (most of them small) along the Greek coast, attributed to the following causes:

- 71 events could be traced to ships,
- 70 were from land-based sources,
- 9 were from other sources, and
- 145 were of unknown origin.

Furthermore,

- 209 events concerned hydrocarbons,
- 61 involved urban effluents,
- 6 concerned solid wastes,
- 5 were associated with other chemicals, and
- 2 involved color substances.

Sixty-nine of these events required use of antipollution equipment (ships, chemicals, skimmers, gathering systems, etc.) by the Greek coast guard to prevent damage to the marine environment.

During the period 1991–1993, Greek courts have ordered those responsible for more than 1 000 pollution events (approximately 650 from ships and 350 from land-based sources) to pay more than a billion drachmas (about USD 400 million) in damages.

Petroleum escaping into the sea from land-based sources and also from marine activities has been reduced in the Mediterranean after the implementation of the MAR-POL convention, but some accidents have caused environmental damage. Since 1980, ten significant accidents (more than 500 t of petroleum discharged into the sea) have occurred in different regions of the Aegean. Pollution from petroleum has led to observation of tar balls along almost every coastline. The wide range of polynuclear aromatic hydrocarbon (PAH) concentrations measured in the Aegean indicates that the most significant pollution remains restricted to near the shore and to enclosed areas.

The inadequate cooperation between Greece and Turkey is an impediment to efforts for protection of the marine environment in the area. The debate between the two countries has a long historical background, but it is also related to management of the wealth of the continental shelf of the Aegean Sea.

Regarding the quality of bathing water, it is well known that the Aegean Sea is one of the main tourist

areas of the Mediterranean; thus, seawater quality has an important significance for vacationers. There is a systematic monitoring of the Greek coastline for total and fecal coliforms from April to October. For 1995, areas that were not in compliance with quality requirements of the European Union comprised 0.7% of 1 500 points along the Greek coast.

The most important and best-studied coastal areas are those of the Saronikos Gulf and the Gulf of Elefsis (near Athens) and the Thermaikos Gulf (near Thessaloniki); both areas are semi-enclosed systems that are influenced by pollution activities and have relatively weak currents. Tidal currents are weak in the Mediterranean and along the Greek coast amount to 30–50 cm at most.

The Saronikos Gulf is considered to be among the most polluted Greek gulfs, and the Gulf of Elefsis is the most eutrophic area in the whole Saronikos region because nutrients are also released from sediments in anoxic periods. About 40% of Greek industries are located on the coast of Attiki, along the northern part of the Saronikos Gulf, and large amounts of industrial effluents (about 100 000 m³/day) are discharged into the sea in this area. Some of the principal industries (oil refineries, shipyards, chemical plants, food processing plants, metals shops, cement industries, etc.) are located within Elefsis Bay. It is estimated that about 20 000 t of petroleum are discharged annually into the Saronikos Gulf.

During the period 1986–1991, about 130 pollution events from ships and about 25 from refineries and industries have been recorded in the Saronikos Gulf.

For many years, untreated sewage from Athens (about 600 000 m³/day) was discharged into the shallow Keratsini Bay through the Central Sewage Outfall. Since September 1994, primary treatment of wastes from Athens has been carried out at the Sewage Treatment Plant at Psytallia Island. The total amount of organic load removed is around 40%. Disposal of effluents through two pipes placed 30 m below the surface at the bottom of the Saronikos Gulf has led to significant differentiation in the distributions of dissolved oxygen and nutrients in the Saronikos Gulf.

Pollution in the Saronikos Gulf influences the abundance, composition, and structure of plankton. Furthermore, pollution tends to reduce the number of species. The benthic fauna of the Gulf are also disturbed mainly in the Gulf of Elefsis, in Keratsini, and near Psytallia where there are extended azoic zones. There is also a disturbance in the population of *Posidonia oceanica*, as it is well known that *Posidonia* is heavily affected by pollution of the Gulf and also by various construction activities in the coastal zone.

The Thermaikos Gulf is a semi-enclosed area into which four major rivers (Aliakmon, Loudias, Axios, and Gallikos) flow, enriching it with organic carbon,

nutrients, and particulate matter. Nutrient concentrations at the mouths of the rivers are high, and the Thermaikos Gulf has nutrient values 2–6 times higher than an oligotrophic area. As a consequence, red tides and phytoplankton blooms have been observed at times in the Thermaikos Gulf, and anoxic conditions develop during the summer period near the harbor of Thessaloniki. Thermaikos Gulf is actually heavily polluted by sewage from Thessaloniki and by industrial effluents from about 250 factories. The sewage waters are estimated at 150 000 m³/d, of which only 30% are treated. A new treatment plant is under construction to handle the entire quantity of sewage.

Environmental Policy, Monitoring, and Protective Measures

In Greece there are 24 protected areas (occupying 223 000 ha) of the following types:

- 8 national parks (60 000 ha),
- 2 natural monuments (18 000 ha),
- 6 nature reserves (11 000 ha), and
- 8 protected landscapes (133 000 ha).

However, the actual protection of natural reserves and habitats of all kinds and the enforcement of existing legislation is very poor owing to:

- practical difficulties (large remote areas),
- insufficient funds and lack of trained personnel,
- complicated and competing responsibilities and structures of public services, and
- lack of voluntary environmental organizations.

Greece's remaining wetlands have been estimated to range up to 190 000 ha, representing a loss of nearly 300 000 ha during this century. Approximately 100 000 ha are included in 11 designated Ramsar sites, where fifteen areas apart from the Ramsar wetlands (based on the convention on wetlands signed in Ramsar, Iran in 1971) have been classified as special protected areas.

There is only one marine park in Greece. The Marine Park of North Sporades was established to protect the monk seal, *Monachus monachus*. It was declared a national park by presidential decree in May 1992. The park is divided into two main protection zones (A and B). Zone A (1 587 km²) is a strict protection zone and in some of its areas, chosen on the basis of urgency for protection, uniqueness, and wilderness of plant and animal life, special protection measures are in force. In Zone B (678 km²), which includes inhabited areas, protection measures are less stringent. Alonnisos is the largest island in the park, which also encompasses 6 smaller inhabited islands and 22 uninhabited islands and rocky outcrops.

Environmental degradation in the area would be a lot more serious and, in many respects, irreversible if

the countries around the Mediterranean had not committed themselves in 1975 to work together to combat the different forms of pollution and to control development. The Mediterranean Action Plan (MAP) is one of the largest international programs in the environmental field; it involves the interaction of 18 countries and the European Union, practically all the major organizations of the United Nations, four Regional Activity Centers, a growing list of nongovernmental organizations, and a vast number of scientists. Over 100 laboratories participating in the Mediterranean Pollution Research and Monitoring Program (MEDPOL) have tracked down, identified, and attempted to understand better, both the sources of pollution and the processes that take place in the sea, the soil, and the air. Athens was selected by the contracting parties in 1981 as the location of the coordinating unit that moved there on 1 July 1982.

Establishment of monitoring systems for measurement of temporal and spatial variations and distributions of principal pollutants is another important result of the MAP/MEDPOL program. The Greek MEDPOL National Monitoring Program includes 211 stations in the Aegean area, mainly at coastal sites, distributed in the six regions of the Saronikos Gulf, Thermaikos Gulf, Gulf of Kavala, Northern Crete, Islands of Lesbos, and Rhodos islands. These stations monitor the following sources of pollution: general coastal areas (20), hot spot end estuarine areas (70), bathing areas (120), and airborne sources (1).

The Ministry of Environment has recently established a similar monitoring network for surface waters, under the coordination of the General State Chemical Laboratory. The network includes 133 sampling stations in rivers and 58 in lakes. There are also automatic online systems for monitoring the quality of riverine waters entering Greece from the north, in order to avoid ecological damage from effluents originating in those neighboring countries.

The main parameters monitored are heavy metals (in seawater, effluent, biota, sediment, suspended matter, and precipitation), halogenated hydrocarbons (in biota, effluent, and sediment), petroleum hydrocarbons (in biota, seawater, and sediment), polyaromatic hydrocarbons (in biota, sediment, effluent, and seawater), total coliforms, fecal coliforms, fecal streptococci, nutrients (in seawater and effluent), chlorophyll (in plankton), total organic carbon and calcium carbonate (in sediment), dissolved ions (in effluent), pesticides and polychlorinated biphenyls (in seawater, effluent, sediment, and biota), as well as standard parameters in seawater. Meteorological parameters and ozone concentrations are also measured in air. Frequency of sampling varies, depending on the pollution parameter group and matrices.

Air pollution monitoring was initiated in Athens about 25 years ago with the measurement of SO_2 . About 10 years ago, an automatic system was installed, which consisted of six stations that measure SO_2 , CO , NO_x , and O_3 continuously. A lot of data have been gathered about the mechanisms causing the atmospheric pollution and its temporal evolution. The principal measures that have been chosen to reduce the effect of atmospheric pollution (thus far, only partially successful) are the following:

- reduction of sulfur content in oil used for domestic heating (3.5%–0.3%),
- prohibition of diesel cars inside Athens,
- reduction of lead content in gasoline (0.84 g/l–0.15 g/l) for noncatalytic cars,
- prohibition of use of half of all private cars in the city center every day and of any cars whose pollutant emissions exceed permitted levels,
- construction of peripheral arteries and some high-level and underground crossings,
- construction of additional subway lines, and
- control of emissions of cars, buses, and industrial sources.

The vital role of chemists is obvious in setting up and maintaining these monitoring systems, in assessing the quality assurance of the analytical results, and in properly evaluating the information in order to improve our knowledge of environmental chemistry and pollution mechanisms and to succeed in improving overall environmental quality according to the principles of sustainable development.

Data for this article came from the following sources:

1. Environmental Statistics (1996). Office des publications officielles des Communautés européennes, Luxembourg, 1997.
2. Europe in numbers (1995). Office des publications officielles des Communautés européennes, Luxembourg, 4th edition, 1995.
3. National Statistics Service of Greece (1996). Environmental Statistics, Year 1994 with Comparative 1993 data, Athens, 1996, pp. 45–50.
4. UNEP (1996). State of the Marine and Coastal Environment in the Mediterranean Region, MAP Technical Reports Series, No. 100, UNEP, Athens, 1996.
5. UNEP(OCA)/MED WG.111/Inf.9 (1996). Survey of pollutants from land-based sources in the Mediterranean. UNEP, Athens, 1996.
6. Dassenakis, M. (1996). Estuarine systems: General characteristics and environmental problems. Presented at scientific conference on “Greek Coasts and Seas at 2000”, University of Perseus, February 1996, Proceedings, pp. 143–164.
7. Psilovikos A. (1992). Prospects for wetlands and waterfowl in Greece. *Manag. Medit. Wetl. and Their*

- Birds, IWRB Spec. Publ. No. 20, pp. 53–55.
8. Sakellariadou, F., Tselentis, V.S., and Tzannatos, E. (1994). Dissolved/dispersed petroleum hydrocarbon content in Greek coastal areas. Presented at international symposium on "Pollution of the Mediterranean Sea", WTSAC, Nicosia, Cyprus, pp. 151–155.

9. Scoullou, M., Dassenakis, M., Zeri, C., Papageorgiou, K., and Rapti M. (1987). Chemical studies of main estuaries and coastal areas of Greece. Progress Report to DG XI, Project GEC-ENV-560 GR.

News from IUPAC

Japanese Version of IUPAC, IUPHAR, and IUTOX Report on Natural and Anthropogenic Environmental Oestrogens: The Scientific Basis for Risk Assessment

IUPAC's Division of Chemistry and the Environment (VI) has prepared a Japanese translation of the Special Issue of *Pure and Applied Chemistry* (Vol. 70, No. 9, 1998) that addressed the scientific underpinning for the controversial international concerns about endocrine disrupters. The translation effort was coordinated by Dr. Junshi Miyamoto, President of IUPAC Division VI. The Special Issue, resulting from the cooperation of three preeminent international scientific organizations, covers a wide range of scientific aspects and subjects relevant to the issue and provides the background information necessary for informed debate.

The 19-chapter report, *Natural and Anthropogenic Environmental Oestrogens: The Scientific Basis for Risk Assessment*, was prepared by IUPAC in collaboration with the International Unions of Pharmacology (IUPHAR) and of Toxicology (IUTOX), and with the support of the International Council for Science (ICSU). The subject, commonly known as *endocrine* or *hormone disrupters*, is a complex, emotional, and controversial issue for which many scientific questions remain. Several aspects related to human and environmental health are presented, and the conclusions and recommendations drafted by the presidents of the three Unions review the policy issues and how they relate to the science.

This publication is the result of continuous efforts to address issues of societal and industrial concern objectively, involving the chemical sciences. A similar report on oil spill countermeasures technologies and response methods was published in January 1999.

For further information, visit <http://www.iupac.org/publications/pac/special/0998/>, or contact Dr. Junshi Miyamoto, Sumitomo Chemical Company, Ltd., 5-33 Kitahama 4-Chome, Chuo-ku, Osaka 541-8550, Japan; E-mail: yokonaga@ohprime.sumitomo-chem-co.jp; Tel.: +81 (6) 6220 3152; Fax: +81 (6) 6220 3550.

IUPAC Observer's Report on the Ninth Meeting of the IPCS Program Advisory Committee, Berlin, Germany, 5–8 October 1998

Dr. John H. Duffus (Edinburgh Centre for Toxicology, 43 Mansionhouse Road, Edinburgh EH9 2JD, Scotland, UK; E-mail: J.H.Duffus@btinternet.com), Chairman of the IUPAC Chemistry and Human Health Division's Commission on Toxicology (VII.C.2) has submitted the following report:

Introduction

The ninth meeting of the International Program on Chemical Safety (IPCS) Program Advisory Committee (PAC-9) was hosted in Berlin, Germany from 5–8 October 1998 by the German Ministry of Environment, Nature Conservation, and Nuclear Safety. Dr. M. Mercier, IPCS Director, noted that two of the three cooperating organizations had been going through a period of reformation and reconstruction. In particular, the World Health Organization (WHO), under its new Director General (Dr. Gro Harlem Brundtland) was developing a structure of "clusters", of which a new cluster on Sustainable Development and Healthy Environment would include the Program on Chemical Safety (PCS).

Dr. P. Toft, IPCS Associate Director, described activities undertaken by IPCS during this period. Presentations were also made by Mr. J. Willis, representing United Nations Environment Program (UNEP) Chemicals, and Dr. J. Takala, representing the International Labor Organization (ILO), to outline activities undertaken by each of their organizations.

Dr. Toft noted that close cooperation had continued with the Food and Agriculture Organization (FAO) in relation to the operations of the Joint Expert Committee on Food Additives (JECFA) and Joint Meeting on Pesticide Residues (JMPPR), as well as with the Organization for Economic Cooperation and Development (OECD) on a number of risk assessment and risk management programs. Also noted was the strengthening of relationships with several nongovernmental organi-

zations, including IUPAC. Some concern was expressed that current WHO restructuring may indicate a subtle shift away from a focus on human health protection toward social health and sustainable development priorities. However, Mrs. Singh, the new Executive Director for Sustainable Development and Healthy Environments, had indicated her commitment to maintaining IPCS as the prime carrier of responsibilities for addressing human health issues arising from chemical use.

In his presentation, Mr. Willis noted that UNEP Chemicals completed negotiation of a legally binding instrument for the Prior Informed Consent (PIC) procedure and initiated negotiations for a legally binding instrument to control Persistent Organic Pollutants (POPs). The continuing strategy of UNEP Chemicals includes strengthening of national capacities for chemicals management, development of cleaner methods of production, and strengthening of partnerships with other stakeholders, including IPCS.

Dr. Takala referred to the strong interaction between ILO and WHO on occupational hygiene and chemical safety issues, with particular emphasis on a globalized approach to resolving issues of social justice and safe working conditions. He outlined some of the methods by which ILO disseminates information on chemical hazards in the workplace, including the availability and utility of CD-ROMs and internet-accessible databases. He noted that completion of the project on harmonization of chemicals classification and labeling (it is hoped by the year 2000) would have a significant impact on ILO programs.

Declarations of Interest

There has been some criticism of IPCS for using experts from industry on working groups assessing certain substances. In order to ensure transparency and to eliminate any suggestion that IPCS assessments may be biased, a form has been developed for participants in IPCS activities to declare potential conflicts of interest. The PAC endorsed the Declaration of Interest form. It is important to ensure the greatest possible expertise on IPCS Expert Groups while safeguarding the objectivity of the process. As this effort may sometimes lead to perceived conflicts of interest, the principle of transparency is particularly important. It was accepted that the form should be used to disqualify experts only when they are being paid to advocate a particular position, or where their potential conflicts of interest are so severe as to call their objectivity into question.

In order to give this matter further consideration, the PAC recommended that a small working group be commissioned to liaise with the IPCS director, representatives of the three cooperating organizations, and their legal advisors where necessary, to report back to

the PAC Standing Committee within six months on issues relating to transparency and disclosure of conflict of interest. The PAC members recommended to constitute this subcommittee are Dr. W. Farland, Dr. R. Fielder, Mr. M. Wright, and, as an independent contributor, Dr. J. H. Duffus. The objective of these activities should be to attain a culture of transparency and objectivity both within IPCS and with outside clients, collaborators, and the interested public.

Interorganization Program for the Sound Management of Chemicals (IOMC)

The IOMC was established in 1995 to serve as a mechanism for coordinating efforts of intergovernmental organizations in the field of chemical safety. The IOMC is designed to be a cooperative undertaking among intergovernmental organizations that, within the framework of their own respective constitutional mandates, work together as partners to promote international work. Scientific and technical work under the framework of the IOMC is carried out through the existing structures of the participating organizations, either individually or jointly. The original six participating organizations are UNEP, ILO, FAO, WHO, United Nations International Development Organization (UNIDO), and OECD. The United Nations Institute for Training and Research (UNITAR) formally joined the IOMC as a participating organization in January 1998.

Specific technical level coordinating groups have been established in relation to the following program or subprogram areas: harmonization of classification and labeling of chemicals, chemical information exchange, chemical accident prevention, preparedness and response, and pollutant release and transfer registers. These groups provide a regular means for all interested bodies working in the respective areas to consult with each other on program plans and activities, and to discuss ways and means of ensuring that the activities are mutually supportive. With agreement of the IOMC participating organizations, international organizations, regional organizations, governments, and interested industry, labor, and public interest groups that have significant activities in the respective areas can be invited to participate in the coordinating groups. The Terms of Reference and Secretariat contact for each of the IOMC coordinating groups is available on the IOMC web site (<http://www.who.int/iomc/cg.html>).

IOMC publishes biannually a calendar of events to inform governments, intergovernmental organizations, and nongovernmental organizations about forthcoming events of the participating organizations in the area of chemical safety related to the programs and work of Chapter 19, Agenda 21. The IOMC calendar is available on the IOMC web site, from the IOMC Secretariat, or from any of the participating organizations. Further-

more, to facilitate provision of information and use of developed materials, an annotated list of available training materials will be posted on the IOMC web site and linked to the Inventory of Information Sources on Chemicals on UNEP's web site.

Reduction of Risk from Exposure to Chemicals

The following various activities were proposed.

Public Awareness Activities

With the goal of promoting the safe use of chemicals through public information and education campaigns, existing materials prepared by IPCS and collected from countries (e.g., publications, audiovisual material, brochures, posters, and examples of poisons prevention campaigns) are being assembled into a package, which may be adapted to the needs of individual countries and used for primary prevention activities.

Characterization of Populations

In order to promote better understanding of the impact of chemicals on vulnerable groups, such as children, women, malnourished people, and specific groups of workers, and to encourage prevention, it was recommended that IPCS consult widely with other organizations who may have collected data on vulnerable populations in order to enable risk assessments for such vulnerable groups to be made using relevant data.

Training Courses and Materials

Training activities for poisoning prevention and treatment include the following:

- *Operating Analytical Facilities:* An introductory (half-day) course by Dr. R. Braithwaite (Birmingham, England, UK) with members of the INTOX Analytical Group. An advanced level (one- to two-week) course, with practical laboratory training, is at the planning stage.
- *Provision of Evaluated Information:* Work plans for preparation of further evaluated documents for poisons control, up to the end of 1999, include 100 Poisons Information Monographs (PIMs), of which 30 will contain analytical sections where laboratory techniques are important for patient diagnosis and management; 23 Treatment Guides; and Antidote Volumes (chelating agents; organophosphorus poisoning; amatoxin, gyrometrine, and isoniazid poisoning; decontamination procedures; and enhancement of elimination). During the biennium 2000–2001, a further 150 PIMs and 3 Antidote Volumes are scheduled for preparation. These publications will be issued on INTOX and INCHEM CD-ROMs biennially, as well as on the INCHEM web site, and summaries of the Antidote Volumes will appear in *Clinical Toxicology*.

- *Information Management Tools and Networking:* Systems development during the period up to the end of 1999 is expected to include the following:

- An enhanced Version 4 of the INTOX CD-ROM, tested for single and multiple PC terminal use, and issued in English, French, Portuguese, and Spanish (for use at poisons centers).
- A database management system for a chemicals products register (for use in ministries and other institutions).
- Specific software applications based on the INTOX system, including a system for the Pesticide Epidemiology Project (see IPCS/PAC/98.15).
- Enhancement of the INTOX CD-ROM, with facilities for downloading substance characteristics and product information into the INTOX Version 4 system.

Other Activities

Other proposed activities include the following:

- Assembling guidance on emergency intervention levels for chemicals in a major incident.
- Expanding the number of Chemical Emergency Response Cards for first responders. A list of priority chemicals is being drawn up, based on a survey of the most commonly involved chemicals in incidents to which emergency services respond.
- Completion and testing of a modular, multilevel training course on chemical incident response for different authorities and issuing material in English, French, and Spanish (depends on availability of funding).
- Completion and testing of the database management software systems for the full range of proposed registries and issuing it in English, French, and Spanish, including the provision of user's manuals and training packages.
- Developing a database that consolidates evaluated information for chemicals emergency response in order to provide a compendium of official reviews of major incidents and results of the international data exchange on incidents; to be issued biannually on CD-ROM and updated regularly on the Web as a contribution to the Global Information Network on Chemicals (GINC) (depends on availability of funding).
- Consolidating an international data exchange mechanism for major chemical incidents with analysis and dissemination of the data (e.g., on CD-ROM and the Web, as proposed above), with consideration of the need for regional mechanisms through regional WHO Collaborating Centers.

Risk Assessment Issues

- The first 12 Concise International Chemical Assessment Documents (CICADs) have been completed and a guidance manual compiled for authors involved in the preparation of these documents. IPCS has collaborated with OECD in the preparation of the documents, and this collaboration will continue to include IPCS involvement in OECD assessments of existing chemicals, concentrating on high production volume chemicals.
- Continuing efforts are being made to ascertain the effective use of Environmental Health Criteria documents to ensure that they are meeting their objectives.
- Risk assessment and safety evaluation of pesticides continues, with increased efforts to obtain and ensure international collaboration in these matters. While appreciating that current IPCS links with FAO on issues of pesticide risk assessment could facilitate the collection of data on pesticide exposures and health impacts, the PAC considered that the problem requires partnership with a broader range of stakeholders, including industry and various national, regional, intergovernmental, and nongovernmental organizations. The PAC recommended that the IOMC may be well placed to assist with coordinating this liaison. Partnership with industry was considered to be vital, because there is a need for ready access to information on pesticide product formulations. The PAC noted and encouraged the further development of efforts to harmonize pesticide risk assessment processes, particularly those intended to make more use of existing national assessment documents.
- The work on risk assessment of endocrine disrupters will produce an online repository of global research on the health and ecological effects of these substances. In addition, a scientific peer-reviewed global assessment document will be published to summarize what is known and what remains unknown about the effects of endocrine disrupters.

Research Methodology

Development of risk assessment methodology will continue, and research in this area will be encouraged, particularly with reference to the derivation of better exposure guidance values. It was recommended that the intended outcomes of the research methodology projects specifically address connectivity with other IPCS risk assessment programs so that they may be applied strategically to achieve overall program objectives. Such projects could also have an important catalytic role in promoting collaborative research activities, seminars, and workshops, with the opportunity to achieve useful outcomes in risk assessment methodology with only a modest investment of scarce IPCS resources. It was further recommended that IPCS continue to play a role in developing methodological documents on the principles of risk assessment.

Conclusion

As an observer at this meeting, I was impressed by the wide range of activities sustained by IPCS on rather meager funds. It is a pity that the work of IPCS is not better known in the chemical community. This relative obscurity exists largely because IPCS has not been as well publicized as it should be by WHO or by national governments via their public information services. For some reason, the publications side of WHO is much less successful in marketing its products than are commercial publishers. Part of the solution, identified by PAC, is to draw the attention of WHO to the need to make the IPCS component of its web site more visible and accessible to those seeking information on chemical safety programs. PAC also recommended that its members actively seek to promote the use of IPCS information resources, such as INCHEM, INTOX, etc., within their own regions. For myself, I strongly recommend that every institution involved in chemistry and concerned about the safety of chemicals make full use of IPCS publications as the most reliable source of evaluated information available in this area.

With great sadness, we report that Prof. Dr. Antonin A. Vlček passed away on Sunday, 10 October 1999. Throughout his career, he was very active in IUPAC. He was a member of the IUPAC Bureau from 1979 to 1987, and he also served as National Representative on the Commission on Electroanalytical Chemistry (V.5) from 1984 to 1991.

News and Notices from Other Societies and Unions

The Morbidity and Mortality of Scientific Illiteracy

This article, by Prof. Donald Weaver, is reprinted with permission from *Canadian Chemical News*, Vol. 51, No. 7, pp. 5–6 (July/August 1999). Prof. Weaver is a Fellow of the Canadian Institute of Chemists (FCIC) and a professor in both the departments of chemistry and medicine at Queen's University in Kingston, Ontario, Canada. He was the winner of the Merck Frosst Centre for Therapeutic Research Lecture Award in 1997 and is currently the director representing the Biological/Medicinal Division on The Canadian Society for Chemistry (CSC) Board of Directors.

Chemistry is the central science, drawing on the basic principles of physics while enabling biological phenomena to be understood at a molecular level. From this unique position, chemistry pervades virtually every aspect of modern life, influencing the quality of the water that sustains our lives, the pharmaceuticals that save our lives, and the advanced materials that enrich our lives. It would seem reasonable that a truly informed person in the modern world should have at least a rudimentary scientific literacy in the molecular sciences (as well as being able to read and write). Regrettably, this is not the case. Scientific illiteracy, scientific innumeracy, and the growth of pseudoscience ("junk science") are the reality. The ramifications of these failings could be disturbingly significant.

Nowhere are the implications of these failings more apparent than in the health care system. Modern society expects a pill for every ill, a molecule for every ailment—and it had better be a molecule with optimal efficacy and minimal toxicity. The obvious, but underappreciated, fact is that drugs and medical treatments are based on molecules. Not surprisingly, the development of medical therapeutics is dependent more on chemistry than on any other scientific discipline. Drugs exert their effects via a receptor, a macromolecule that is crucial to the pathogenesis of the disease under study. A first step in the rational drug design process is the resolution of the three-dimensional structure of this receptor by a structural chemist, such as an X-ray crystallographer. Next, the medicinal chemists and organic chemists design and synthesize drug molecules to bind with the receptor. Computational chemists and molecular modelers facilitate this drug design process. Analytical chemists aid in determining the drug's pharmacokinetic half-life and metabolic properties. Finally, process chemists and chemical engineers work out methods for scale-up and quality control. This

sequence of events is poorly appreciated in the general population for whom the realization that "physicians don't discover drugs, chemists do" is a startling revelation.

The failure to appreciate chemistry and the molecular sciences is apparent on an everyday basis in medical practice. In my own medical practice, the following five cases occurred during a recent two-month period.

The first was a patient who refused to receive intravenous antimigraine drugs because she was concerned that the sodium chloride and glucose in the intravenous solutions were synthetic in origin. She passionately believed that the molecules and even the constituent atoms themselves were fundamentally different between synthetic glucose and natural source glucose. For the safety of her own health, she "did not want to be exposed to synthetic atoms and molecules".

The second was a patient who abruptly stopped his antiseizure medications. He did so after purchasing two rather large horseshoe magnets which he now places on either side of his head when he sleeps at night. He informed me that the magnetic field promotes the electrons of his brain molecules into higher energy levels, thus permitting "truly natural healing to take place". In fact, he was disturbed that I was unaware of such basic scientific principles as applied to issues of human health care. Because he had suddenly stopped his anticonvulsant drugs, he experienced several severe seizures producing a painful recurrent shoulder dislocation.

The third was a patient who stopped taking her cholinesterase enzyme inhibitor for Alzheimer's disease. At her family's urging, she was taking large doses of Vitamin E and *Ginkgo biloba* at four times the recommended daily dose, because "everyone knows that natural products are safer". The family refused to believe that their mother's recent hemorrhages were due to this mixture of agents—"vitamins and natural products are inherently safe and quite harmless".

The fourth is a patient who suddenly stopped his anticonvulsant drugs and began to consume massive doses of vitamin B6 to cure his epilepsy. He had learned of this supposed cure from an Internet chat group. He soon developed severe numbness in his hands and feet from vitamin B6 toxicity, but refused to believe that a natural product could produce such side effects. Moreover, since he had precipitously stopped his anticonvulsant drugs, he experienced multiple seizures, resulting in the loss of his driver's license and ultimately his job.

The fifth is an epileptic patient who decided to forego her conventional therapy in order to have "the bone

plates in her skull manipulated". She had read that the skull is composed of bones that fuse as a young child. She had been told that incorrect fusion of these bones "impedes the harmonious flow of chemicals over the surface of her brain", thus causing seizures. She now visits an alternative medicine practitioner who literally beats up her head once a month, supposedly to realign this claimed aberrant bone fusion. She stopped taking her anticonvulsants and has recently experienced a recurrence of her seizures. Not surprisingly, she now also has headaches.

These five people are not educationally deprived—all have high school education, and two have post-secondary school education. They are simply average Canadians trying to do what they think is best for themselves.

The problem of scientific ignorance on the part of patients and their families is by no means restricted to patients with neurological problems. It is an issue that is becoming increasingly widespread. A recent high-profile court case reported from Hull, Québec further attests to this problem. A Québec naturotherapist has been convicted of criminal negligence causing death after telling the family of a diabetic girl to substitute baths and herbal remedies for her insulin shots. The 12-year-old girl died from complications of her diabetes on 28 March 1994. She died for want of insulin in Canada, the homeland of Banting and Best.

The situation is probably only going to get worse. Medical therapeutics are getting more complicated. With the new millennium will come improved receptor site-specific drugs, gene therapies, anti-apoptotic agents, and a variety of other increasingly sophisticated chemical attacks on human disease. Members of the general public are increasingly less equipped to deal with such issues. This situation calls into question that sacred concept called "informed consent". As every physician knows (and as every lawyer is quick to remind us), it is the obligation of the physician to ensure that patients understand their therapies. Where does one start? Is it truly possible to obtain informed consent from an individual who genuinely believes that having her head systematically punched once a month to reshape skull morphology will beneficially influence neurotransmitter flow in the superficial layers of the cerebral cortex? Furthermore, with medical schools deleting chemistry as a prerequisite (to pursue "more human-centered disciplines"), the physicians themselves won't understand the newly evolving molecular-based therapies. It will ultimately be a situation with the blind leading the blind.

Concomitant with this rise in scientific illiteracy has been the blossoming of so-called alternative therapies. Yes, the snake oil salesman is back! Most alternative therapies are well intentioned, some may work, and a number are probably fraudulent. Alternative therapies

come in a wide variety, including the good, the bad, and the downright ridiculous. First, there is the megavitamin approach. This regimen is based upon the notion that if a little of something is good for you, then a whole lot is probably really good for you. Apart from producing expensive and usually brightly colored urine, there are little, if any hard data to support the widespread use of large doses of vitamins. Next are the dietary approaches. There are the high-protein/low-carbohydrate, high-carbohydrate/low-protein, high-protein, and no-protein diets—all with the exact same therapeutic objective. These diets are sometimes coadministered with high colonic enemas and irrigations "to purge the body of its toxic chemicals". Once again, there is no scientific evidence to suggest that bowel toxins contribute significantly to the plethora of human suffering. Finally, there are the therapeutic touch practitioners. Therapeutic touch involves practitioners systematically waving their hands over the affected individual. This practice supposedly promotes therapeutic perturbations in the conventionally undetectable human energy fields surrounding the patient.

Of all the alternative therapies, the most rapidly growing is the use of herbal remedies. In 1997, North Americans spent an estimated \$12 billion for herbal and mineral products. Between 1993 and 1998, this market grew by 30–50 percent. Within this same time frame, the U.S. Food and Drug Administration received 2 621 reports of serious health effects—including 101 mortalities—linked to supplements. A small number of supplements dominate in the market. DHEA is a hormone reported to boost energy levels, augment muscle healing, and slow aging—it certainly received glowing recommendations from Mark McGwire. However, when it comes to toxicity DHEA doesn't hit the ball out of the park; it may increase the risk of breast and prostate cancer. Another agent with mixed effects is ephedra. Although ephedra (ma huang) has been purported to control weight while it reinvigorates, its use has been linked to high blood pressure, headaches, seizures, and even death. Like ephedra, yohimbe has also been put forth as an agent to reinvigorate and even to augment male sexuality; however, it possibly produces weakness, paralysis, or death. Echinacea is widely used in the prevention and treatment of viral upper respiratory tract infections. Although several trials have suggested that the herb might reduce cold symptoms, long-term use may paradoxically produce immune-system suppression. A 1997 U.S. study suggested that *Ginkgo biloba* may symptomatically improve mental performance in patients with mild to moderate dementia. Nevertheless, its use is sometimes complicated by bleeding problems, gastrointestinal disturbances, and headache. Finally, there is saw palmetto. Preliminary work suggests that saw palmetto shows promise for benign enlarged prostate disease; however, it too has its Achil-

les' heel, causing stomach upset, headache, and even erectile dysfunction.

The problem with alternative therapies like the herbals is not with their potential therapeutic benefits. Herbal remedies do contain an interesting mixture of flavone glycosides, terpene lactones, and various phenolic derivatives. Most chemists would agree that Mother Nature is a truly amazing synthetic chemist and that natural products such as herbals do represent an opportunity for impressive molecular diversity. In fact, the recent growth of combinatorial chemistry is an attempt to reproduce this diversity generation in the laboratory setting. Rather, the problem with alternative therapies is the failure of society to hold them accountable to the same rigorous scientific scrutiny used for conventional drugs. Just because they are natural, doesn't make them safer. After all, cobra venom comes from an all natural source. The worsening of scientific illiteracy and scientific innumeracy, combined with the flourishing growth of pseudoscience, is not helping to ameliorate this situation.

In general, society places less value on the pursuit of scientific rigor, and is increasingly less inclined to listen to its mainstream scientists. When it comes to chemistry and the physical sciences, people think of thalidomide, DDT, and plutonium bombs. They do not think of penicillin, AZT, and Dacron aortic patches. A truly appalling event occurred earlier this year in Washington, DC, when members of the Committee on Government Reform listened raptly to actress Jane Seymour extol the virtues of alternative medicine, such as homeopathic treatments for cancer and acne. Dr. Quinn, Medicine Woman, was invited to present at the inquiry because "actresses are role models who have tremendous effects on public attitudes", and thus their opinions on science should be studied ("I'm not a doctor, but I play one on TV"). On the other hand, when the Nobel laureate Gertrude Elion recently died, her life did not make the cover of *Time Magazine* or the national newscasts. Elion had been involved in the discovery of drugs such as azathioprine, trimethoprim, and acyclovir (to name only three of the many drugs to which she was a central contributor). However, this hat trick of discoveries is not enough to get her into the record books of the lay press. She did not strive for personal fortune or fame. She didn't set NHL, NBA, or box office records. She just used good rigorous science to save many lives and to help humankind.

In the next millennium, humankind will have to confront an array of assaults. There is the specter of prion diseases, killer viruses, drug-resistant bacteria, and environmental cancers—prospects made even more scary by the decline of scientific literacy and the rise of pseudoscience. It is not productive to stick our heads in the sand while arrogantly decrying reductionism and the tenets of Western science. These problems cannot

be avoided; they will have to be confronted using good rigorous science as a weapon of salvation—a weapon hopefully wielded by people who know how!

Report of First Annual Meeting of National Authority Representatives and First Meeting of Chemical Industry Representatives Organization for the Prohibition of Chemical Weapons (OPCW), The Hague, Netherlands, 26–27 June 1999

Benjamin C. Garrett [10704 Cogswell Place, Fairfax Station, VA 22039-1823 USA; E-mail: garrettb@battelle.org; Tel.: +1 703 978 1873 (home), +1 703 413 7837 (office); Fax: +1 703 413 8880] has submitted the following report:

Summary

The first annual meeting of National Authority¹ representatives and the first meeting of chemical industry representatives was held 26–27 June 1999 at the Organization for the Prohibition of Chemical Weapons (OPCW), The Hague, The Netherlands.² Hosted by the OPCW, the meeting was intended to provide an overview of OPCW activities, especially those performed in support of inspections. Most of the meeting consisted of scripted briefings by OPCW staff. Occasional opportunities were afforded for comments from participants. Attendance was overwhelmingly from the National Authorities and their delegations, with chemical industry representatives comprising about ten percent of the audience.

The presentations demonstrated that the work of the OPCW is well organized and brisk; that scientific input is on occasion both solicited and considered; and that additional work by the OPCW may be needed to maintain the confidence of scientists, who share in the burden of complying with the Chemical Weapons Convention (CWC).³ The meeting concluded without specific comments regarding the prospects of a second meeting of chemical industry representatives and without specific requests for input from nongovernmental organizations or individuals.

Background

The CWC entered into force in April 1997. At the time of the meeting, 125 nations had ratified and acceded to the CWC. The CWC mandates, among other things, that each States Party must:

- declare and destroy all chemical weapon stockpiles on its territory;
- undertake certain obligations regarding the destruc-

- tion of old and abandoned chemical weapons;⁴ and
- submit to an elaborate and potentially intrusive regime of data declarations and on-site inspections to maintain confidence that prohibited activities are not taking place.

This meeting marked the first annual gathering of representatives from the offices of the National Authorities of the States Parties as well as the first gathering of representatives from chemical industry. The International Union of Pure and Applied Chemistry (IUPAC) was invited to participate as a representative of chemical industry.

The meeting took place over a weekend. On the following Monday, 28 June, a week-long session of the Conference of States Parties began. Therefore, many National Authority representatives had already gathered in The Hague, and their turnout at this meeting was excellent—between 200 and 250.⁵ There were about 25–27 chemical industry representatives. The agenda, list of participants, and other materials handed out at the meeting are listed at the end of this report, and copies can be obtained from the author.

Selected Meeting Issues

The meeting was given over to various presentations, mostly by OPCW staff. Occasions were afforded for discussion, although these occasions were limited. The discussion periods were dominated by three issues:

1. conduct of inspections, with the discussion topic being experiences of industry as the inspected party;
2. concentration limit for mixtures containing one or more Schedule 2 or Schedule 3 chemicals⁶ as a component, with the discussion topic being the lack of harmonization among States Parties regarding a threshold for reporting relative to the concentration of Schedule 2 or 3 chemical in the mix; and
3. declarations and inspections for Discrete Organic Chemicals (DOCs),⁷ with the discussion topic being the approach the OPCW Inspectorate might take in conducting inspections of DOC facilities.

Issues of possible interest to the IUPAC membership that failed to be discussed during this meeting include the following:

- destruction of old and abandoned chemical weapons;
- destruction of chemical weapon stockpiles; and
- conversion of facilities formerly associated with chemical weapons.

The failure to discuss these (and other) issues more likely reflects the limited time available for discussion of any issues than it does a conscious effort by the OPCW to avoid confronting these issues.

Conduct of Inspections

Several presentations dealt with the conduct of inspections. Comments from chemical industry representatives suggested that:

- Industries, in general, have confidence that the OPCW has instituted procedures to safeguard confidential business information, including results from on-site inspections.
- Industries are monitoring the time required to comply with inspections and with other CWC requirements. Data collected to date suggest the time requirements are modest, but the chemical industries remain concerned that the time requirements may increase.
- Industries remain unconvinced that the OPCW has placed its monitoring and inspection requirements into the full context of all such monitoring and inspecting taking place at any one industrial site. Specifically, industries must address requests from national and regional authorities for monitoring and inspecting general site health and safety; labor practices; compliance with Good Laboratory Practices (GLPs), Good Manufacturing Practices (GMPs), and similar food- and drug-related requirements; and reporting of revenue (taxes), including treatment of tax-free and reduced-tax chemicals. Therefore, the prospect exists for several inspections occurring simultaneously, each demanding immediate access and full attention from industry personnel.

The meeting concluded without any position taken on the issue of the conduct of inspection, and this topic is certain to be discussed at any future meetings of National Authority and chemical industry representatives. But the general feeling was that the OPCW has earned the confidence of both States Parties and industry in the inspections conducted thus far.

Concentration Limit for Mixtures

For purposes of reporting exports and imports of Scheduled chemicals, the CWC sets no threshold for the amount (concentration) of a Schedule 2 or a Schedule 3 chemical present in mixtures. The OPCW might establish a threshold, but so far has failed to achieve a consensus on this issue. Therefore, States Parties are free to set their own threshold. This situation prevails, with some States Parties having no lower limit (that is, any amount of a Schedule 2 or 3 chemical present in a mixture requires that the mixture be declared for purposes of export and import). Other States Parties have set limits or thresholds; 20–30% thresholds seem common (that is, if a mix contains less than the threshold of a Schedule 2 or 3 chemical or of all Schedule 2 and 3 chemicals in aggregate, then that mix is exempt from declaration for export and import purposes).

The lack of harmonization among States Parties in dealing with Schedule 2 and 3 chemicals in mixtures was important to chemical industry representatives, as evidenced by papers submitted by industry groups and by the comments made during the meeting. The OPCW staff appeared attentive to industry comments, but were unprepared to deal with this issue in any substantive way. Therefore, there was no sense of closure on the issue, which is certain to be the subject of any future meeting.

Discrete Organic Chemicals

A States Party is obliged to make an initial declaration of DOC production facilities for plants “which produced by synthesis...[a DOC] containing the elements phosphorus, sulfur, or fluorine” (CWC, Verification Annex, Part IX, paragraph 1). Such a DOC is referred to as a PSF-chemical.

The chemical industry representatives were particularly interested in the issue of DOC facility inspections because inspections will start in May 2000, unless the Conference of States Parties, by consensus, agrees to postpone.⁸

As discussed during the meeting, DOC facility inspections pose a peculiar challenge both to the inspectors and to the inspected party. According to the OPCW Inspectorate staff, the objective of the inspection should be to demonstrate the absence of Schedule 1 chemicals. Therefore, the inspection exercise proves a negative; that is, the inspectors must show that no Schedule 1 chemicals are present (in this context, at a DOC facility producing a PSF-chemical).

To fulfill this objective, the inspector presupposes the negative: namely, “Schedule 1 chemicals are present”. Then the inspector examines every aspect of the DOC facility to locate a Schedule 1 chemical and, if none is found, assumes they are all absent. No threshold has been established for Schedule 1 chemicals, and while inspection at the molecular level seems absurd, it has not been expressly ruled out. Therefore, the potential for an intrusive and time-consuming DOC facility inspection is great.

The OPCW Inspectorate’s approach for DOC inspection differs, however, from the one of demonstrating the absence of Schedule 1 chemicals. The difference seems rooted in political realities and the consensus-building that typify all OPCW activities. The agreed-upon approach, as stated during this meeting, is that the inspectors will examine the facility and its records to determine whether the facility declaration is consistent with what is observed and what can be deduced via records. In reality, this inspection documents the validity and consistency of the DOC declaration, rather than demonstrating the absence of a Schedule 1 chemical. Therefore, a Schedule 1 chemical might be found on inspection if and only if its production causes some

perceptible alteration to what one might normally associate with DOC production.

In reality, the DOC production facility inspection regime will verify the validity of a DOC declaration, rather than demonstrate the absence of a Schedule 1 chemical. This approach appears manageable (unlike the approach of demonstrating the absence of a chemical). It remains unproved whether this approach will also ensure the arms control objective of prohibiting chemical weapon production.

Because DOC facility inspections begin in 2000, this issue is certain to merit attention at any followup meeting of chemical industry representatives.

Conclusions and Recommendations

The discussions during the first annual meeting of National Authority representatives and the first meeting of chemical industry representatives were enlightening but inconclusive. Several issues surfaced where the input of scientists—especially those working in chemical industry—might benefit the work of the OPCW as well as the effectiveness of the CWC. Based on this meeting, there appears to be no consensus regarding a threshold for Schedule 2 and 3 chemicals in mixtures. Similarly, the approach to inspecting DOC facilities is evolving. In both instances, IUPAC might consider providing a “Friend of the Chair” technical paper outlining the scientific and technical considerations that bear on the risk to the purposes of the CWC.

Meeting Materials⁹

OPCW Informational Papers

“Guidelines for determining declarable industrial facilities”, Organization for the Prohibition of Chemical Weapons, November, 1998, 23 pp.

“The regulation of the international transfer of chemicals by the Chemical Weapons Convention”, Organization for the Prohibition of Chemical Weapons, November, 1998, 4 pp.

OPCW (1998). *Images*, The Hague, The Netherlands, 36 pp. [Note: *Images* is a glossy brochure describing the OPCW.]

OPCW Presentations

Forgacs, Laszlo (Head, Operations and planning branch, Inspectorate, OPCW) “Confidential business information (CBI) issues and resolution during CWC inspections”.

Gee, John (Deputy Director-General, OPCW). “Opening remarks”.

Guerra, Gaston (Head, Declarations branch, Verification division, OPCW). “Making declarations work, part I (Imports and exports)”.

“International cooperation programmes” (undated), 3 pp.

Kane, Anand, and Gilliquet, Jean-Nicolas (Policy officers and Inspectors, Inspectorate, OPCW). "Issues resulting from industry inspections".

Makhubalo, John (Director, International cooperation and assistance, OPCW). "Closing Remarks".

N'Guessan, Eugene (Inspector, Inspectorate, OPCW). "In-house preparation for inspection team members".

Shimamoto, Shu (Daicel Chemical Industries, Ltd., and Japan Chemical Industry Association, Japan). "Low concentration limit and inspection frequency of Schedule 2 plant site".

Skripin, Yuri (Inspector, Inspectorate, OPCW). "Conduct of inspection on Schedule 2 facilities, Schedule 3 facilities, and other chemical production facilities".

Wadhwa, Anil (Head, Government relations and political affairs branch, External relations division, OPCW). "Issues of interest to National Authorities and chemical industry".

Yu, Zhiyong (Mission planning coordinator, Operations and planning branch, Inspectorate, OPCW). "Keeping ready for inspections. Operational aspects on receiving and escorting inspections".

Presentations by Others

[Australia] Safeguards and nonproliferation office, Government of Australia. "Making declarations work: Export and import".

[CEFIC] European Chemical Industry Council/Conseil Europeen de L'Industries Chimique (CEFIC). "Discussion paper." [Topic: Feedback from industry on the implementation of the CWC.]

[CEFIC] European Chemical Industry Council/Conseil Europeen de L'Industries Chimique (CEFIC). "Discussion paper on low concentration issue."

[Czech Republic] Government of the Czech Republic. "Status of the implementation of the Chemical Weapons Convention in the Czech Republic".

[Japan] Igarashi, Takuya (Chemical weapons control policy office, Ministry of International Trade and Industry, Government of Japan). "Lesson [sic] from investigation into discrepancies in import and export data of Schedule 2 and 3 chemicals".

[Pakistan] Government of Pakistan. "Making declarations work. Pakistan's experience."

[Sweden] Government of Sweden. "Manual for inspections of Schedule 3-plant sites", 24 June 1999, 24 pp.

[Switzerland] de Sá, Liliana (Federal office of foreign economic affairs, Government of Switzerland). "Dealing with industry declarations".

Meeting Administrative Materials

Program for the First Annual Meeting of National Authorities and Chemical Industry Representatives, The

Hague, 26–27 June 1999.
List of Participants, First Annual Meeting of the National Authorities and Chemical Industry, The Hague, 26–27 June 1999.

Notes

1. The term "National Authority" has a precise meaning within the context of the OPCW. A National Authority is that person, persons, or office designated by a States Party to deal with the OPCW on issues regarding compliance.
2. This meeting was given various names by the staff of the OPCW, creating some confusion. The name listed here is taken from the original invitation distributed by the OPCW. While the OPCW staff intend to have the gathering of National Authority representatives be an annual affair, there was no such intention stated regarding the meeting of chemical industry representatives.
3. The proper name for this arms control treaty is "Convention on the prohibition of the development, production, stockpiling, and use of chemical weapons and on their destruction". *Chemical Weapons Convention* and *Chemical Weapons Treaty* are commonly used, as is the abbreviation *CWC*. That abbreviation is used in this report. All references to the CWC are taken from the English version.
4. "Old chemical weapons" is a category separate from "abandoned chemical weapons". Often, though, for purposes of discussion, the two are lumped together as "old and abandoned chemical weapons". That practice is followed here.
5. Many National Authority representatives are members of the Permanent Delegations of their respective States Party. Such members have permanent passes to the OPCW and were not required to register for the meeting. Therefore, the list of participants fails to capture the presence of such persons, causing a significant undercounting of overall attendance. The attendance figure given here was derived by counting attendees (minus OPCW staff).
6. The CWC provides three schedules of chemicals. In brief, a Schedule 1 chemical is one that has both been a chemical weapon and poses a high risk to the purpose of the CWC. An example is sulfur mustard [*bis*(2-chloroethyl)sulfide]. A Schedule 2 chemical is one that may be a precursor to a Schedule 1 chemical, poses significant risk to the purposes of the CWC, and is not produced in large commercial quantities. An example is thiodiglycol [*bis*(2-hydroxyethyl)sulfide], used in producing sulfur mustard. A Schedule 3 chemical is one that has been a chemical weapon, poses a risk, and may be produced in large commercial quantities. An example is chlorine.
7. The CWC defines a DOC to be "any chemical belonging to the class of chemical compounds consisting of all compounds of carbon except for its oxides, sulfides, and metal carbonates, identifiable by chemical name, by structural formula, if known, and by [CAS] registry number, if assigned" (Verification Annex, Part I, paragraph 4).
8. The Conference of States Parties met 28 June through 2 July and did *not* reach a consensus on postponing DOC facility inspections. Therefore, these inspections should start in 2000, barring some unforeseen development.
9. A copy can be provided on request to the author.

Reports from IUPAC-Sponsored Symposia

3rd International Symposium on Molecular Mobility and Order in Polymer Systems, 7–10 June 1999, St. Petersburg, Russia

This symposium continued the series of St. Petersburg meetings sponsored by IUPAC and organized by the Institute of Macromolecular Compounds of the Russian Academy of Sciences (RAS) and the Department of General and Technical Chemistry of the RAS. This meeting was also supported by the Russian Foundation for Basic Research and the St. Petersburg Research Center of the RAS. The symposium took place in the House of Scientists (the former Duke Vladimir's palace) located on the Neva River embankment in the picturesque center of the city close to the well-known Hermitage museum.

This symposium (as well as the first one in 1994) was oriented more toward dynamic and relaxation phenomena, whereas discussions at the second symposium (May 1996) were focused mainly on problems of structure and order. Of course, these shifts in the main thrust of the symposium were never too dramatic because mobility in polymer physics and in physical chemistry, just as in real life, is inseparable from the order (or disorder!) of the systems.

Principal topics of the symposium included the following:

- conformation and mobility of macromolecules in solutions, melts, and networks in strong external fields
- structure and properties of liquid-crystalline polymers
- block copolymers
- polymer layers, brushes, and micelles
- polymer complexes and membranes
- structure and dynamics of branched polymer systems, stars, dendrimers, and networks

All systems considered share a common general feature in that the order presented in them is "soft", and a pronounced molecular mobility exists in them.

The symposium featured 18 invited plenary lectures, 32 contributed lectures, and 180 poster presentations. This meeting was a truly international one, with lectures and posters presented by scientists from Canada, the Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Israel, Japan, Kazakhstan, Lithuania, the Netherlands, Portugal, Russia, Spain, Sweden, Turkey, the United States, Uzbekistan, the Ukraine, and the United Kingdom. Plenary and contributed lectures were presented by eminent, classical leaders in poly-

mer science (such as Profs. S. F. Edwards, T. M. Birshtein, G. J. Fleer, K. L. Ngai, Yu. Ya. Gotlib, etc.) and also by well-known, active younger researchers. The dynamic poster session was accompanied by very lively discussions.

A short account of the materials presented at the symposium was published in the book of abstracts made available to participants. Some invited plenary and contributed lectures are published as Volume 146 of *Macromolecular Symposia* (1999) by Wiley-VCH in Weinheim, Germany. Although not all the speakers will be able to present their lectures in this volume (some of the material had been published earlier or submitted elsewhere), it will provide a good representation of the scope of the meeting and the problems discussed.

Because of the close interconnection between different topics, materials presented at the symposium could be divided largely into two main areas: "mobility–structure–order" and "structure–order–properties". Lectures devoted to polymer dynamics (mobility–structure–order) described various types of relaxation phenomena on different time and length scales (from nanoscale to macroscopic scale), which were investigated by a broad variety of experimental methods, including polarized luminescence, differential scanning calorimetry (DSC), dielectric relaxation and vibrational spectroscopy, nuclear magnetic resonance (NMR), and quasi-electric neutron and X-ray scattering, among others. Theoretical work and computer simulations emphasized a detailed study of the collective motions in complex multichain systems and the effects of strong external or internal fields (as in crystalline phases). Theoretical approaches to unsolved problems of dynamics in melts, networks, and semi-ordered glassy systems were considered, taking into account the hierarchy of molecular motions and interactions.

Lectures on structure–order–properties were devoted to study of the interconnection between chemical constitution, morphology, and order for a broad class of macromolecular systems (see principal topics listed above), including biological polyelectrolyte systems (liposomal membranes), hydrogels, block copolymers, monolayers, mesophases, etc. The many experimental methods employed included electron and X-ray spectroscopy, nonlinear optic phenomena fluorescent probes, and various experimental methods for the investigation of polyelectrolytes. Principal interest in the structure–order–properties area is centered around systems with complex chemical constitution and morphology, such as polyelectrolytes, copolymers, mesophases, and glassy states with local ordering.

This symposium was well organized. The weather

was beautiful, and participants were able to enjoy sightseeing in St. Petersburg and its near suburbs. The organizers of the symposium are very grateful to IUPAC for its sponsorship and help in publishing the lectures presented.

The organizing committee believes that this symposium has made a significant contribution to understanding the interconnection of mobility and order in complex and heterogeneous polymer systems, including polyelectrolytes and biopolymers. Continuation of this series of symposia should be very effective and fruitful for the subsequent development of polymer science and the fostering of cooperation among theorists, experimentalists, and scientists from different countries, schools, and communities of science.

Professor V. A. Kabanov
Department of Polymer Science
Moscow State University, Moscow, Russia

**International Memorial K. I. Zamaraev
Conference on Physical Methods for
Catalytic Research at the Molecular
Level, 28 June–2 July 1999,
Novosibirsk, Russia**

This conference was held at the Novosibirsk Scientific Center under the auspices of the Boreskov Institute of Catalysis on the 60th anniversary of the birth of Professor Kirill I. Zamaraev, who took an active part in the work of IUPAC for many years until his untimely death in 1996. Prof. Zamaraev was President of IUPAC from 1994 to 1995 and served as Chairman of the IUPAC Physical Chemistry Division from 1987 to 1989. He was also the Director of the Boreskov Institute from 1984 to 1995, and he made considerable contributions to the establishment of relationships between fundamental and applied areas of catalysis. Prof. Zamaraev's comprehensive approach to the application of physical methods to catalytic studies is inherent in the work of the Boreskov Institute in Novosibirsk today.

Organizers of the conference, besides IUPAC, included the International Association for the Promotion of Cooperation with Scientists from Independent States of the Former Soviet Union (INTAS), the Russian Foundation for Basic Research (RFBR), the Russian Mendeleev Chemical Society (Novosibirsk Department, Russia), and the Russian Scientific Council on Catalysis (Moscow, Russia). Almost 200 chemists, mostly from scientific research centers and universities in Germany, France, the United States, the United Kingdom, the Netherlands, Italy, China, Korea, Belgium, Japan, Spain, Ireland, Russia, Kazakhstan, Ukraine, Azerbaijan, and Belarus, attended the conference.

The scientific program included 12 invited plenary lectures, 12 keynote lectures, 32 oral presentations, and

98 posters covering the following topics:

- quantum-chemical studies on the electronic structure of active components in catalysts, and molecular adsorption at active sites
- physical methods for surface science studies and studies of adsorption processes
- experimental studies on the structure of active sites of heterogeneous catalysts and on the elementary mechanisms of heterogeneous catalytic reactions
- experimental studies on elementary mechanisms of homogeneous catalytic reactions
- development of new methods and approaches to *in situ* catalytic studies

Studies of heterogeneous catalysis by various *in situ* methods revealed a distinct difference between the state of catalysts in equilibrium with the ambient environment and those in nonequilibrium conditions with the reaction medium. This finding is of real interest to several IUPAC commissions that are developing recommendations for application of new methods of studies of chemically reactive systems. We will probably soon need a correction of existing terminology or development of special glossaries for describing very complicated nonequilibrium phenomena. Of special interest to IUPAC's analytical chemistry commissions was the presentation of a largely new analytical method called "differential dissolution", which aims to determine rapidly the phase composition of complex multiphase solids without any reference samples. This method appears to be very sensitive when coupled with modern atomic analyzers; it is able to distinguish seven to eight different phases in a sample of microgram weight.

Nineteen research projects funded by INTAS were discussed at the Scientific INTAS session organized by the INTAS Secretariat to run simultaneously with the conference. The conference also featured presentations by the Boreskov Institute of Catalysis, IUPAC, and INTAS, and there was an exhibition of analytical equipment sponsored by Shimadzu Europa GmbH.

Other conference activities included evenings of music and dance, excursions, and a special sightseeing program for accompanying persons. A postconference tour of the wonderful Altay Mountains also took place.

A book of abstracts of the conference manuscripts, edited by Prof. V. N. Parmon and Prof. D. I. Kochubey, was published and distributed to participants at the meeting. The main contributions will also be published after the conference in a special issue of the *Journal of Molecular Catalysis*.

**Professor V. N. Parmon, Conference Chairman
and Institute Director**

Mrs. L. Ya. Startseva, Conference Secretary
Boreskov Institute of Catalysis
Novosibirsk, Russia

10th International Symposium on
Organometallic Chemistry Directed To-
wards Organic Synthesis (OMCOS 10),
18–22 July 1999, Versailles, France

This symposium attracted an audience of 1 100 people, 984 of whom were active researchers. Attendees came from 36 countries, including 316 from France and 678 from abroad. There were 5 plenary lectures, plus an award lecture, 15 invited lectures, 29 contributed papers and short communications, and 542 poster presentations. The conference was well organized, with many young, active participants. Because the conference organizers were able to attract many important sponsors and thus markedly reduce fees, OMCOS 10 was open to unprecedented numbers of young researchers and to important contributors from Eastern Europe.

The idea of the OMCOS symposia originated 20 years ago in IUPAC's Division of Organic Chemistry. Since then, each event in the series became a milestone, thus demonstrating that the philosophy behind OMCOS is relevant and timely. Each of the symposia marked a new level reached by organic synthesis aided by organometallics, thus serving as a stimulus to push further ahead research joining organic synthesis, coordination chemistry, catalysis, etc.

OMCOS 10, too, became a true feast of the fascinating science of organometallic synthetic methodology, combining brilliant organization, great research, and a memorable historical stage. The conference chairman, Prof. Jean-Pierre Genet, and his team worked very hard, and their efforts were fully rewarded. The conference halls were always filled; even the temptations of beautiful Versailles and the impressive social program did not divert many people from witnessing the dramatic live performances given by masters of the art of synthesis.

The overall level of any symposium is defined by the level of the top speakers. In this respect, the level of OMCOS 10 was among the highest. Beginning with the introductory speech of Prof. Jiro Tsuji, one of the founding fathers of organic synthesis aided by organometallics, and including lectures by leading scientists such as R. Noyori, D. Evans, M. Reetz, and many others, the conference program offered something satisfying for everybody. Many former chairmen of previous OMCOS meetings took part in OMCOS 10.

Enantioselective transition metal catalysis served as the center of discussions. A large share of presentations dealt with design and synthesis of enantioselective catalysts and chiral ligands, and with their applications in both new and well-known reactions. But OMCOS 10 differed from earlier symposia in the series by its display of much deeper interest in the use of transition metal catalysis for the preparation of new materials.

This rapidly growing area continues to capture more and more attention.

Professor Irina Beletskaya
Department of Chemistry
Moscow State University, Moscow, Russia

1st IUPAC Workshop on Advanced
Material: Nanostructured Systems
(WAM-1), 19–22 July 1999,
Hong Kong, China

This meeting represents the first of IUPAC's efforts to become involved in the identification and characterization of novel research directions by the organization of workshops on new directions in chemistry. Hong Kong University for Science and Technology (HKUST) and the Georgia Institute of Technology, Athens, GA, USA were IUPAC's cosponsors for WAM-1, which focused on the theory, synthesis, and properties of nanoparticles; quantum dots and quantum wells; nanotubes; nanowires and nanorods, self-assembly; bio-inspired structures; and nanotechnology.

WAM-1 grew out of the belief that new research fields, where the activity is truly international, are expected to contribute to high-quality, significant scientific development and to constitute the cutting edge for new technologies. The idea of holding the meeting in Hong Kong was to get scientists active in advanced materials research from the West to interact strongly with those from the Orient. Indeed, this first workshop has fulfilled the twin goals of international representation and high technical quality, with participation of 59 scientists from 14 countries (7 from the Far East: China (both mainland and Hong Kong), Japan, Korea, Philippines, Singapore, and Taiwan; and 7 from the West: Canada, France, Germany, Israel, Spain, the United Kingdom, and the United States) in a program of scientific presentations of extremely high technical merit.

In an act of serendipity that made the timing of WAM-1 as exciting as its content, on the last day of the meeting the *New York Times* published an article entitled "Computers Poised for a Great Leap", which emphasized the role of nanostructures in new molecular computer technology. The publicity reverberated worldwide and further reinforced IUPAC's wisdom in beginning to sponsor workshops in frontier areas of chemical research.

Manuscripts from WAM-1 will be published in a special issue of *Pure and Applied Chemistry*.

Professor Mostafa El-Sayed, Chairman
WAM-1 Organizing Committee

Professor Joshua Jortner, President of IUPAC

19th Discussion Conference on
Rheology of Polymer Systems,
19–22 July 1999,
Prague, Czech Republic

This conference was the 58th 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 under the auspices of the IUPAC Macromolecular Division. The aim of the conference was to provide a discussion forum for experts in the field of polymer rheology, with special emphasis on a structural understanding of macroscopic phenomena of multiphase systems.

The program committee, with Dr. Ivan Fortelený as Conference Chairman, succeeded in arranging a very interesting scientific program with many prominent speakers. Attendees included 73 participants from 23 countries. The topics of the conference were covered in 6 main lectures, 70 special lectures, and 27 poster contributions. In addition, two panel discussions were organized on problems of rheometry and processing in multiphase polymer systems (discussion leader: A. Ya. Malkin, Russia) and problems of the description of structure formation and evolution in molten multiphase polymer systems (discussion leader: J. Lyngae-Jørgensen, Denmark).

Main lectures included the following: “Quantitative predictions of the viscoelasticity of polymer melts” (R. G. Larson, USA), “Wall slip of polymer melts—measurement and industrial relevance” (H. M. Laun, Germany), “Some unusual rheology–morphology relationships in polymer blends” (V. G. Kulichikhin, Russia), “Long-time relaxations in rubber-modified polymer systems” (Y. Aoki, Japan), “Rheology of immiscible blends: relations to structure” (J. Mewis, Belgium), and “Rheology of reactive polymer blends” (A. Muller, France).

The meeting was well organized, and the program was conducted in a smooth and efficient manner. There were sufficient opportunities for vivid and fruitful discussions. In addition to the scientific program, the participants enjoyed a welcoming reception, an interesting excursion to historic places in the surroundings of Prague, and a splendid conference dinner.

Both the main lectures and special lectures will be published as a volume of *Macromolecular Symposia*.

Dr. H. M. Laun
Titular Member, IUPAC Commission IV.2 on
Polymer Characterization and Properties

Analytical Science into the Next
Millennium (SAC 99),
25–30 July 1999,
Dublin, Ireland

This conference, cosponsored with IUPAC by the Analytical Division of The Royal Society of Chemistry, attracted 300 participants from all over the world. Each morning there was a plenary session, followed by three parallel sessions in the afternoon. Every session had a distinct subject theme. There were 9 plenary lectures and 13 invited lectures among the 44 talks given at the conference. In addition, 100 posters were displayed, and a special poster discussion session was held on Thursday afternoon.

Plenary lectures covered topics of the sessions that followed. At the opening ceremony, D. T. Burns (Queen’s University, Belfast, Northern Ireland) spoke on the “Irish contribution to analytical chemistry”. T. Layloff (U.S. Food and Drug Administration, Washington, DC, USA) opened the session on Analysis for the Public Good with his talk “Analytical regulatory challenges: a world changed from cottage industries to mega-multinationals”. The next session on Process Analysis and Control featured A. Garrison (University of Tennessee, Knoxville, USA) lecturing on “Optimal utilization of analyzers in control”. A session on Molecular Recognition and Sensors began with O. Wolfbeis (University of Regensburg, Germany) discussing “Molecular recognition at interfaces: the basis for advanced chemical sensing and biosensing. The last plenary session on New Developments in Analytical Instrumentation started with a talk by A. Manz (Imperial College, London, England, UK) on “Chip technology for DNA analysis”. There was also an afternoon plenary lecture by U. Th. Brinkman (Free University of Amsterdam, Netherlands) on “Multidimensionality in trace-level analysis: hyphenation and coupled column techniques”.

An enjoyable social program kept participants busy in the evenings, and visits to historical places were organized for Wednesday afternoon. Accompanying persons had full-day programs of their own. On Tuesday night, a civic reception was held in the presence of the Lord Mayor of Dublin. The conference banquet on Thursday evening was organized at the National Centre for Arts (formerly known as the Royal Hospital Kilmainham, founded in 1680). After-dinner speakers included the President of the Analytical Division of the Royal Society of Chemistry, the President of Dublin City University, and an Irish government minister. At the banquet, the SAC Gold Medal was awarded to Professor Malcolm Smyth, who headed the organizing committee of this memorable meeting.

Manuscripts from all plenary and invited speakers will be published in a special issue of The Royal Society of Chemistry's analytical journal *The Analyst*.

**Professor Gyula Svehla (formerly of University College, Cork, Ireland)
Secretary, IUPAC Analytical Division V (1987–1993)**

**26th International Conference on
Solution Chemistry (ICSC),
26–31 July 1999,
Fukuoka City, Kyushu, Japan**

About 470 people, including students and accompanying persons, from 25 countries attended this conference. Japanese participants numbered 337, and foreign registrants totaled 118, including 19 from the United States, 9 from France, 8 from Germany and Hungary, 7 from the United Kingdom and Australia, 3 from Korea and India, 2 from China and Taipei, 4 from Russia, 3 from Belarus and Slovenia, 2 from Estonia, 1 from Ukraine, 2 from Nigeria, and 1 from Tunisia. There were 65 students from Japan and 13 from abroad.

Although it rained almost throughout the entire conference, accompanying persons still were able to enjoy touring the landscape of Fukuoka and the northern part of Kyushu island.

Plenary lecturers included Harry Gray (USA), who spoke on "Electron tunneling in biological molecules"; Ivano Bertini (Italy), who lectured about "Solution structure of paramagnetic metalloproteins"; J. N. Israelachivili (USA), who spoke about "Hydration and electrostatic interactions between hydrophilic molecules and surfaces in aqueous solutions"; Manfred Zeidler (Germany), who presented "New results for NMR relaxation in liquids"; and Toshio Yamaguchi (Japan), who lectured on "New horizons in hydrogen-bonded clusters in solution".

The program subcommittee, chaired by Toshihiro Tominaga of Okayama University of Science, arranged nine sessions (S) and six minisymposia (M) with the following subjects and organizers:

- (S1) Theoretical approaches and computer simulations—Susumu Okazaki of Tokyo Institute of Technology
- (S2) Structure, dynamics, and fluctuation—Masaru Nakahara of Kyoto University
- (S3) Structure, thermodynamics, kinetics, and reaction mechanisms of coordination compounds in solution—Masaaki Tabata of Saga University
- (S4) Chemical thermodynamics in solution—Takayoshi Kimura of Kinki University
- (S5) Analytical and environmental aspects in solution chemistry—Tohru Miyajima of Saga University

- (S6) Bioinorganic and pharmaceutical chemistry—Akira Odani of Nagoya University and Helmut Sigel of the University of Basel
- (S7) Polymers, colloids, and interfaces in the solution phase—Hiroshi Maeda of Kyushu University
- (S8) Role of reaction field in organic chemistry: Theory and experiment—Hiroshi Yamataka of Osaka University
- (S9) Industrial applications of solution chemistry—Isao Taniguchi of Kumamoto University
- (M1) Equilibrium and nonequilibrium theories of molecular liquids—Fumio Hirata of the Institute for Molecular Science
- (M2) Fast reaction dynamics in solution—Tadashi Okada of Osaka University
- (M3) Recent progress in redox chemistry of coordinated compounds and metalloenzymes—Yoichi Sasaki of Hokkaido University
- (M4) Hydrophobic interactions in complex and organized systems—Shinobu Koda of Nagoya University
- (M5) Recent progress of nonaqueous and mixed solvents in analytical and inorganic chemistry—Haruhiko Yokoyama of Yokohama City University
- (M6) How much do we know about water at the molecular level?—Hiroyasu Nomura of Nagoya University

Participants at the conference presented 337 papers, including 5 plenary lectures, 135 oral presentations (invited and contributed papers), and 197 posters. All lecture rooms seemed to be full during the entire conference, and enthusiastic discussions occurred at every session.

In addition to the scientific sessions and minisymposia, there was a Fukuoka Forum for Citizens, entitled "Science of Water" on the afternoon of 29 July when most foreign participants enjoyed the traditional half-day excursion of the conference. The forum, which featured lectures in Japanese by H. Ohtaki (Ritsumeikan University), Nobuyuki Nishi (Institute for Molecular Science), Koji Yamanaka (Organo Co., Ltd.), and Yasushi Kitano (Nagoya University), attracted about 150 nonscientific people from the town of Fukuoka.

Attendees enjoyed a get-together party on 26 July, a reception on 27 July, a concert with the Japanese instruments "koto" and "shamisen" on 28 July by Mrs. Prof. Tabata and her student, a traditional half-day excursion on 29 July to visit Arita (the town of porcelains, sometimes called "imari" in Europe) and Karatsu and to enjoy a boat cruise on Hakata Bay, and the conference banquet on 30 July. A postconference tour was organized to visit Kumamoto Castle, Aso volcanic mountain, and a Sake brewery company in Hita city. Besides these social events, a rich program was made available for accompanying persons every day of the conference.

This conference enjoyed the highest attendance in the history of the ICSC, and many participants commented on the high quality of the presentations, the wide scope of topics in solution chemistry, and the excellent program for accompanying persons (planned by Prof. Tohru Miyajima of Saga University and the local subcommittee).

Financial support for the conference was given by the Science Council of Japan, 16 organizations and foundations, and many private companies to ensure its sound financing in spite of the serious economic situation of Japan at present.

At the international steering committee meeting on the evening of 28 July, Manfred Zeidler of Aachen, Germany, who will be Chairman of the 27th ICSC, discussed preparations for the next conference to be held 26–31 August 2001 in Vaals, Netherlands. Members of the steering committee received copies of the first circular for the 27th ICSC, and they also decided to hold the 28th ICSC in Debrecen, Hungary with Gabor Palinkas of Budapest as Chairman.

Professor Hitoshi Ohtaki
Department of Chemistry, Ritsumeikan University
Chairman of 26th ICSC and IUPAC Bureau
Member

14th International Symposium on Plasma Chemistry (ISPC-14), 2–6 August 1999, Prague, Czech Republic

This biennial symposium encompassed the whole area of plasma chemistry, with topics ranging from the basic physics and chemistry of thermal and low-pressure nonequilibrium (cold) plasmas to industrial processes, processing techniques, and equipment. ISPC-14 included a Plasma Equipment Exhibition and was preceded by a three-day Summer School on Plasma Chemistry (29–31 July) and followed by a two-day Workshop on Industrial Applications of Plasma Processing (6–7 August).

Of the 510 attendees at ISPC-14, 76 were Czech and 434 came from 42 other countries. The 553 contributions included 8 invited plenary lectures, 18 invited topical lectures, 158 oral presentations, and 369 posters. The five-volume symposium proceedings contained 486 papers amounting to 2 877 pages. Specific topics included basic physical and chemical processes in plasmas, modeling and diagnostics of plasmas, plasma generation, plasma–particle interaction, plasma–surface interaction, plasma etching, plasma CVD, plasma synthesis, plasma spraying, plasma metallurgy, environmental applications, and industrial applications.

The summer school attracted 33 participants to its course on low-pressure nonequilibrium plasmas, and 29 people attended the course on thermal plasmas. The

workshop included a total of 12 lectures, with four each on the topics of thermal plasmas, plasma surface processing, and plasma polymerization.

Social events associated with ISPC-14 included a welcoming party on Monday, a concert on Tuesday, tours and a visit to the Institute of Plasma Physics on Wednesday, and a dinner on Thursday.

The next symposium in the series, ISPC-15, also with a summer school and workshop, will be held in Orléans, France in July 2001.

Professor André Ricard
Chairman, IUPAC Physical Chemistry Division (I)
Subcommittee on Plasma Chemistry

Horizons of Organic and Organoelement Chemistry, 6–10 September 1999, Moscow, Russia

This conference was dedicated to Academician Aleksander N. Nesmeyanov (1899–1980) on the 100th anniversary of his birth. Professor Nesmeyanov was an outstanding Russian scientist, brilliant chemist, and gifted scientific administrator. He was president of the Russian Academy of Sciences, rector of M. V. Lomonosov Moscow State University, and initial director of the Institute of Organoelement Compounds named after him. Professor Nesmeyanov was a member of a number of foreign academies and societies and received honorary doctorates from many western universities.

Professor O. M. Nefedov gave a talk at the opening ceremony as official IUPAC representative and Vice-President of the Russian Academy of Sciences. The conference attracted 455 scientists, including 421 from Russia, 4 from the United States, 4 from the United Kingdom, 4 from Germany, 3 from Switzerland, 1 from Portugal, 1 from Japan, 4 from China, 1 from South Korea, 1 from Poland, 1 from the Czech Republic, 5 from Latvia, 1 from Ukraine, and 4 from Belarus. There were 10 plenary lectures, 32 invited lectures, 22 oral presentations, and 200 poster presentations. Many young scientists from different regions of Russia gave 18 oral presentations and presented 112 posters.

The scope of the conference covered synthesis, structures and reactivity, stereochemistry, catalysis, physical methods of investigation, and new materials and technology. It also encompassed the 7th Open Russian Conference on Organometallic Chemistry, a school–conference for young scientists on Organometallic Chemistry Towards the 21st Century, and sections on organic chemistry and organophosphorus compounds.

The conference admirably achieved its stated goals of summing up the results of fundamental and applied organic and organoelement chemistry and of defining the perspectives of development and selecting those ar-

reas that demand united international efforts. The meeting provided an important forum for consolidating the current efforts of Russian scientists with those of researchers from abroad.

Professor Yuri N. Bubnov
Chairman of the Organizing Committee

New Books and Publications

New Books from IUPAC

***Organic Mesoscopic Chemistry. Chemistry for the 21st Century Monograph.* Edited by H. Masuhara and F. C. de Schryver. Blackwell Science (1999), pp. ix + 1–304. ISBN 0-632-05125-6, USD 100.**

Contents

Theoretical Approaches to Dynamics in Nanoscale System; Photoinduced Jumps of Single Molecules: Probing Structural Relaxation in Solids on a Nanoscopic Scale; Dual and Single-Molecule Fluorescence Spectroscopy: Towards Kinetic Observation of Single Molecule Reactions; Space-Resolved Study of Porphyrin Rings: Local Optical Properties and Formation Mechanism; Laser Chemistry of Individual Microparticles; Hierarchical Structuring of Nanostructured 2-Dimensional Polymer Assemblies; Dynamics and Photochemistry of 2-Dimensional Molecular Crystals at the Liquid–Solid Interface; The Organic Microcrystals; Spectroscopic Analysis of Inhomogeneous Structures in Single Microparticles; A Miniaturized Total Chemical Analysis System; Imaging Single Cells and Single Molecules; Analytical Chemistry and Biophysics in the Single Molecular Level

This book is one in IUPAC's series entitled Chemistry for the 21st Century. The aim of this series is to gather together articles about areas of chemistry in which there is currently much active research and those that potentially will have an important impact on chemistry in the future.

Most chemical reactions have been studied in gas phase and solution systems; however, these systems are relatively homogeneous and, hence, space-resolved chemistry has not received much attention. However, the development of confocal optical microscopy and the invention of various types of scanning probe microscopy have led to the concept of space resolution in chemistry. Microscopy techniques, combined with solid–phase chemistry and the study of position-dependent physical and chemical properties, the effect of dopants and defects, surface and interface reactions, and fabricated and modified functionality, are now considered to be fascinating subjects. Furthermore, laser spectroscopy can be extended to such small domains: a laser beam can be focused to the diffraction limit and penetrates as an eva-

nescent wave; in addition, its photon density is very high, and short pulses are available. Thus, the combination of laser and microscopy techniques has opened up new areas of research in the field of organic mesoscopic chemistry.

The volume focuses on organic molecular systems and reviews relevant fields of active research. The importance of the mesoscopic dimension in chemistry is explained in the Introduction. Chapters 1–12 summarize research in different areas. Chapter 1 discusses theoretical approaches to dynamics in nanoscale systems, while Chapters 2 and 3 describe studies on single molecules. Chapters 4 and 5 present molecular aggregates and microparticles as representative examples of space- and time-resolved spectroscopy and chemistry. Chapter 6 discusses the hierarchical structure of polymer assemblies, and Chapter 7 provides an overview of organic microcrystals. Advances in analytical chemistry are now firmly rooted in the mesoscopic dimension, and Chapters 8–12 present new aspects of relevant fields.

The editors are grateful to all the contributors for accepting our invitation and for taking the time to write their detailed chapters. We also wish to thank Blackwell Science for the fine job they have done in the production of this volume.

**H. Masuhara, Department of Applied Physics,
Faculty of Engineering, Osaka University, Suita,
Japan**

**F. C. de Schryver, Department of Chemistry,
Katholieke Universiteit Leuven, Heverlee,
Belgium**

Japanese Translation of *Natural and Anthropogenic Environmental Oestrogens: The Scientific Basis for Risk Assessment. Special Issue of Pure and Applied Chemistry* (Vol. 70, No. 9, 1998). Edited by A. N. Wright and A. E. Fischli; Translation coordinated by Junshi Miyamoto. IUPAC (1999), pp. xvi + 1–350. ISBN 4-87326-315-8, JY 12 000.

Please refer to the article under “News from IUPAC” on page 7 of this issue for details on the content of this book and how to obtain a copy of it.

New Products from IUPAC and Academic Software

SolEq: Solution Equilibria, Principles and Applications. 1999. On CD for Windows 95, 98, and NT. Published and distributed by Academic Software; Web site: <http://www.acadsoft.co.uk>; E-mail: soleq@acadsoft.co.uk

The SolEq tutorials on Solution Equilibria result from collaboration between Academic Software (UK) and IUPAC Commission V.6. Their completion was marked by a small celebration at the Berlin General Assembly on 8 August 1999.

SolEq is an exciting new product—a totally new concept for teaching solution equilibria and environmental chemistry. It contains 27 tutorials on solution equilibria, covering both principles and applications. Tutorials link to 8 software packages that provide the student/researcher with the tools necessary to complete equilibrium calculations on complex systems. SolEq tutorials link theory with calculations and with applications such as acid rain, soil weathering, metals in natural waters, marine CO₂, metals in blood plasma, and chelation therapy.

Tutorial topics include acids-bases-buffers (3 tutorials), redox and electron activity (3), metal–ligand systems (6), energetics (2), heterogeneous equilibria (3), titration simulations (2), and speciation calculations. Software packages provide a powerful speciation program (Species); a subset of SC-Database; buffer calculations; simulations of acid-base, metal–ligand, redox, and precipitation titrations; and correction of log K for I and T.

SolEq tutorials have a soft book format. Hypertext links are used extensively to include illustrations, graphs, tables, worked examples, mathematical deri-

vations, etc. To obtain a hard copy, the user can download tutorials as Microsoft Word files for printing in A5 format. From tutorial pages, exercises link interactively with software packages via toolbar icons. All exercises have fully worked answers.

The principal target group is university/polytechnic senior undergraduates, but SolEq will also be invaluable to university and industrial researchers and non-specialists who require equilibrium modeling skills.

The tutorials are the culmination of writing contributions from many countries, including the United Kingdom, Sweden, Hungary, Kenya, Russia, New Zealand, and the United States. They have been tested with student groups in Russia, Brazil, New Zealand, the United Kingdom, and Sweden and refined on the basis of student feedback.

Marketing is by Academic Software. For further information, downloadable demonstration tutorials, and purchasing information, see the Academic Software web site at <http://www.acadsoft.co.uk>.

Professor Kip Powell
Chairman, IUPAC Commission on Equilibrium Data (V.6)

New Book from The Royal Society of Chemistry

Metabolic Pathways of Agrochemicals, Part 2, Insecticides and Fungicides. Editors-in-Chief: Terry R. Roberts (JSC International Ltd., UK) and David H. Hutson (Consultant, UK).

The Royal Society of Chemistry announces that Part 2 of its major reference source *Metabolic Pathways of Agrochemicals* is now available. Covering *Insecticides and Fungicides*, Part 2 complements Part 1, *Herbicides and Plant Growth Regulators*, which was published in 1998. Together, this two-volume publication provides comprehensive coverage of chemical degradation and metabolism of agrochemicals in soils, plants, and animals.

Containing information on over 300 chemicals currently in use, Part 2 also encompasses nematicides, rodenticides, insect growth modulators, and plant activators in addition to insecticides and fungicides. Part 2 contains details on all the important classes of active ingredients, including organophosphate and pyrethroid insecticides, azoles, and the newly developed strobilurin fungicides. Modulators of insect growth and behavior are discussed, as are the fates of most cur-



SolEq Celebration at IUPAC Berlin General Assembly on 8 August 1999.

rently used rodenticides and nematicides. Organized by compound class and covering 40 years of literature, including previously unpublished information from agrochemical companies, *Metabolic Pathways of Agrochemicals* comprises the following:

- separate entries for each pesticide
- overviews of the metabolism of specific classes of agrochemicals
- key similarities and significant differences between individual chemicals in the class
- extensive bibliography
- comprehensive, high-quality indexes (chemical/common name, CAS registry number, reaction type)

Compiled by a highly respected team of international editors, each part of *Metabolic Pathways of Agrochemicals* can be purchased individually or as a set.

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.

ISBN: 0-85404-499-X; xxiv + 1 486 pages; Price: GBP 225.00; Hardcover, 1999.

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/metpath> or <http://www.chemsoc.org/>.

Awards and Prizes

Stephen Heller Wins American Chemical Society Award

Dr. Stephen R. Heller, Member of IUPAC's Committee on Printed and Electronic Publications (CPEP) and guest researcher at the National Institute of Standards and Technology, Gaithersburg, MD, USA, has won the prestigious Herman Skolnik Award of the American Chemical Society Division of Chemical Information for 2000, jointly with G. W. A. (Bill) Milne, the Editor of the *Journal of Chemical Information and Computer Sciences*.

Thomas Tidwell Wins Royal Society of Chemistry Award

Prof. Thomas T. Tidwell, Secretary of IUPAC's Organic Chemistry Division (III) and Professor in the Department of Chemistry, University of Toronto, Ontario, Canada, is the winner of the 1998 Royal Society of Chemistry Award for Organic Reaction Mechanisms, sponsored by the BP Research and Engineering Centre.

Conference Announcements

Practical Experiences in the Use of Transgenic Crops, 25 January 2000, London, England, UK

Topics to be discussed at this meeting include the following:

- benefits and issues related to the use of transgenic crops
- transgenic corn—the way forward
- why the American Soybean Association supports transgenic soybeans
- transgenic crops: a view from the United States Extension Service
- agricultural and commercial advantages of transgenic crops
- commercial opportunities and farmer value
- importance of genomics to the future of crop production
- industry perspective

For additional information, contact Sonia at the Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS, England, UK; E-mail: soniaw@chemind.demon.co.uk; Tel.: +44 171 235 3681; Fax: +44 171 823 1698.

11th Royal Australian Chemical Institute Convention (11RACIC): Chemistry into the New Millennium, 6–11 February 2000, Canberra, Australia

This conference, held at the Australian National University in Canberra every four years, is a major activity of the Royal Australian Chemical Institute. Chemists worldwide are invited to participate in this major scientific gathering of national and international authorities in all areas of chemistry. Emphasis will be on innovative ideas for future research in chemistry.

For further information, contact Conference Logistics, P.O. Box 505, Curtin, ACT 2605, Australia; E-mail:

conference@conlog.com.au; Tel.: +61 2 6281 6624; Fax: +61 2 6285 1336; or view the conference web site at <http://www.IIRACIC.conf.au/>.

Membrane Technology in Water and Wastewater Treatment, 26–29 March 2000, Lancaster, England, UK

This meeting at Lancaster University, sponsored by the Separation Science and Technology Group of the Society of Chemical Industry, the Royal Society of Chemistry Water Chemistry Group, Institute of Chemical Engineers (IChemE), and the European Desalination Society, will cover the treatment of ground and surface water, backwash water, seawater, and industrial and domestic wastewaters. The aim of the event is to promote the use of membrane technology using microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), and reverse osmosis (RO) for a range of water treatment applications.

For more information, contact Mrs. E. Wellington; E-mail: confsec@dial.pipex.com; Tel./Fax: +44 1275 853311.

2nd International Conference on Genomics, 29–31 March 2000, Cambridge, England, UK

Genomics is poised to play an increasing role in medicine and agriculture. In the next few years, the complete sequences of hundreds of genomes will be available, and recent developments have indicated that the human genome sequence will be finished ahead of the 2005 target date. These sequence data will be accompanied by a vast amount of additional information, including results of comparative genomics, RNA and protein expression profiles, functional and pathway information, and tools for molecular and cell biology.

Providing a broad, in-depth overview of new discoveries and commercial developments, this conference, to be held at Churchill College, Cambridge University and cosponsored by the Society of Chemical Industry Bioactive Sciences Group and Cambridge and Great Eastern Section, will look at how this wealth of information is going to be interpreted; how information will be managed and shared; the impact genomics has had in the commercial environment; and what are the future opportunities for exploitation of genomic information?

For additional information, contact L. G. Copping; Tel./Fax: +44 1799 521369 or G. Dixon, Tel.: +44 1625 513305; Fax: +44 1625 517436.

Hazards XV—The Process, Its Safety, and The Environment—Getting It Right, 4–6 April 2000, Manchester, England, UK

Cosponsors for this meeting at the Manchester Materials Science Centre (UMIST) include the Society of Chemical Industry Health and Safety Group and the Institute of Chemical Engineers (IChemE). Discussion topics include the impact on new technology, environmental impact (including the new Integrated Pollution Prevention and Control Regulations), safety and the environment, emergency planning, and transportation and storage of hazardous chemicals.

For further information, contact Mr. M. J. Adams; E-mail: mikeadams@valrichardson.com; Tel.: +44 1539 732845; Fax: +44 1539 724055.

International Conference on Metrology—Trends and Applications in Calibration and Testing Laboratories, 16–18 May 2000, Jerusalem, Israel

This Forum is being organized by the National Conference of Standard Laboratories (NCSL), the Cooperation International for Traceability in Analytical Chemistry (CITAC), and the Israeli Metrological Society. Topics to be covered include the following:

- metrology as a science and as an integral part of business in industry and trade
- legal metrology
- regional metrological organization
- measurement methods and their validation
- instruments and their qualification
- measurement standards and reference materials
- interlaboratory comparisons
- proficiency testing
- uncertainty in measurement and analysis
- traceability
- laboratory information management systems
- accreditation of calibration and testing (analytical) laboratories
- ethical problems in metrology
- education in the third millennium

For more information, contact Dr. Henry Horwitz, Conference Secretariat, ISAS—International Seminars, P.O. Box 34001, Jerusalem 91340, Israel; E-mail: isas@netvision.net.il; Tel.: +972 2 652 0574; Fax: +972 2 652 0558.

Symposium on Reference Materials for Technologies in the New Millennium, 21–23 May 2000, Berlin, Germany

This symposium, jointly organized with EURACHEM and other institutions, will provide an opportunity for international exchange of information on, and experi-

ence with, reference materials (RM) between prominent RM users and producers with a focus on materials analysis. Sessions will be dedicated to specific topics in the following areas:

General aspects

- providing RMs with traceable specifications and how to use them to establish traceability in chemical measurement
- certification strategies
- RM types and categories, RM databases

Certification of chemical composition

- pure materials and elemental solutions
- metal matrices, ceramics, and glasses
- semiconductors and high-tech materials

Certification of physical properties

- porous materials, particle-size RMs
- chromatography-column materials
- multiphase systems

Invited lectures, as well as contributed oral and poster presentations, will show the latest state of development in these fields.

For further information on submitting oral/poster contributions and/or on participating in the symposium, contact Dr. P. Klobes, Federal Institute for Materials Research and Testing (BAM), Dept. I.1, Richard-Willstaetter-Str. 11, D-12489 Berlin, Germany; E-mail: peter.klobes@bam.de; Tel.: +49 30 6392 5825; Fax: 49 30 6392 5972.

2000 London International Chlorine Symposium, 31 May–2 June 2000, London, England, UK

This meeting, sponsored by the Society of Chemical Industry Electrochemical Technology Group, is to be held at the Gloucester Hotel. The symposium aims to build on the success and popularity of past symposia in the series and to look toward the future of chlorine as well as to address technological developments, associated safety and environmental issues, and the economic outlook for chlorine.

For more information, contact the Society of Chemical Industry Conference Department, 14/15 Belgrave Square, London SW1X 8PS, England, UK; E-mail: members@chemind.demon.co.uk; Tel.: +44 171 235 3681; Fax: +44 171 823 1698.

IUPAC Workshop on Atmospheric Deposition and Impacts on Ecosystems with Particular Reference to the Mideast, 5 June 2000, Tel Aviv, Israel

Atmospheric deposition of pollutants on fresh water ecosystems is particularly relevant for regions and coun-

tries in the arid zones, such as the Middle East including Israel. This short symposium, sponsored by IUPAC, the Israel Ministry of Science, and the Israel Chemical Society, is intended to bring together internationally recognized experts in the field of atmospheric deposition with other scientists who are working on this topic in Europe, the Middle East, and elsewhere, and with members of the IUPAC Division of Environmental Chemistry (VI); Commission on Atmospheric Chemistry (VI.2); and Commission on Soil and Water Chemistry (VI.3). Points of discussion will include the following:

- cause–effect relationships between deposition and factors affecting the conditions and the health of ecosystems
- monitoring and estimation tools to overcome interdisciplinary and international transboundary problems
- interactions and synergisms between pollutants and predictive understanding of integrated land/water systems

This one-day symposium will include three sessions of 2.5 hours each, all starting with two tutorial overviews on wet and dry deposition, followed by contributed presentations. Topics to be covered include the following:

- fundamentals of dry deposition
- fundamentals of wet deposition
- atmospheric deposition over Europe
- atmospheric deposition over Israel
- Great Lakes atmospheric deposition studies
- Kineret Lake atmospheric deposition studies
- atmospheric deposition on the eastern coast of the Mediterranean Sea
- atmospheric dust and cloud physics and chemistry

There will also be a panel discussion featuring representatives of the Israeli Ministry of the Environment, the United States Environmental Protection Agency, IMAP or IGBP, and EUROTRAC.

For additional information, contact Prof. Rene van Grieken, Micro- and Trace Analysis Center, University of Antwerp (UIA), B-2610 Antwerp, Belgium; E-mail: vgrieken@uia.ua.ac.be; Tel.: +32 3 8202362 or +32 477 702165 (mobile); Fax: +32 3 8202376; Web site: <http://inch.uia.ac.be/u/vgrieken/> or contact Dr. Yehuda Shevah, Tahal Consulting Eng. Ltd., 16th O. Box 11170, Tel Aviv, 61111, Israel; E-mail: tahalcmp@netvision.net.il; Tel.: + 972 3 636 9615; Fax: +972 3 636 9754.

31st Annual Short Course on Advances in Emulsion Polymerization and Latex Technology, 5–9 June 2000, Bethlehem, Pennsylvania, USA

This one-week program at Lehigh University is designed for engineers, chemists, other scientists, and managers who are actively involved in emulsion work and for those who wish to develop expertise in the area.

The course is an in-depth study of the synthesis and properties of high polymer latexes. The subject matter includes a balance of theory and applications as well as a balance between chemical and physical problems. Lectures, given by leading academic and industrial workers, begin with introductory material and review, and progress through recent research results. The course fee is USD 1 000 for the entire week or USD 350 per day for any part.

For further information, contact Professor Mohamed S. El-Aasser, Emulsion Polymers Institute, Lehigh University, 111 Research Drive, Bethlehem, PA, USA 18015; E-mail: mse0@lehigh.edu; Tel.: +1 610 758 3082; Fax: +1 610 758 5880.

26th SCAR and 12th COMNAP, 10–22 July 2000, Tokyo, Japan

This joint meeting of the Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programs (COMNAP) will be held at the National Olympics Memorial Youth Center, which is located in Shinjuku in the central part of Tokyo.

From 10–14 July, all SCAR working groups, a group of specialists on seals, JCADM, COMNAP/SCALOP, and the SCALOP Symposium (11 July) will meet. From 17–21 July, all SCAR delegates will meet, and other meetings will be convened as requested.

For more information, contact XXVI SCAR and XII COMNAP Meetings Secretariat, National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173-8515, Japan; E-mail: SCAR2000@nipr.ac.jp; Tel.: +81-3-3962-4722; Fax: +81-3-3962-2529; Web site: <http://www.nipr.ac.jp/SCAR-COMNAP-2000-TO-KYO/>.

33rd COSPAR Scientific Assembly, 16–23 July 2000, Warsaw, Poland

This meeting of the Committee on Space Research (COSPAR), also known as COSPAR 2000, will be held at the Warsaw University of Technology. The conference will be hosted jointly by the University and by the Polish Academy of Sciences (PAS). It is supported by the State Committee for Scientific Research (KBN) as the main sponsor and by numerous local institutions and science societies.

Approximately 80 meetings and symposia at the assembly will cover the following topics:

- Earth's surface, meteorology, and climate
- Earth–moon system, planets, and small bodies of the solar system
- upper atmospheres of the Earth and planets, including reference atmospheres
- space plasmas in the solar system, including planetary magnetospheres
- research in astrophysics
- life sciences as related to space
- materials sciences in space
- fundamental physics in space
- space debris
- satellite dynamics
- scientific ballooning
- radiation belts
- space weather
- integrated global observation system—role and benefits for developing countries
- public understanding of space science

Conference manuscripts will be published in *Advances in Space Research*.

For more information, contact COSPAR Secretariat, 51 bd de Montmorency, 75016 Paris, France; E-mail: COSPAR@paris7.jussieu.fr; Tel.: +33 1 45 25 06 79; Fax: +33 1 40 50 98 27; Web site: <http://www.copernicus.org/COSPAR/COSPAR.html>.

IUPAC-TACTRI/COA International Workshop on Pesticides 2000: Harmonization of Pesticide Management—Regulation, Monitoring, and Evaluation, 3–6 October 2000, Taichung, Taiwan

This workshop will be sponsored by IUPAC's Commission on Agrochemicals and the Environment (VI.4) and hosted by the Taiwan Agricultural Chemicals and Toxic Substances Research Institute, Council of Agriculture (TACTRI/COA).

The IUPAC Commission on Agrochemicals and the Environment seeks to advance research understanding and promote environmental stewardship and human safety with agrochemicals through its publications, international pesticide congresses, and regional workshops. This workshop, following highly successful IUPAC-sponsored scientific meetings during the past several years in London; Sao Paulo; Washington, DC; and Bangkok, continues the initiative to encourage exchange of the latest information on pesticide management approaches and to advance the most practical and scientific approaches around the world.

The workshop will include keynote lectures and poster presentations on the following topics:

1. Pesticide regulation

- harmonized approaches for pesticide registration
- international standards for technical grade pesticides

- international standards for pesticide MRLs
- international trade: export and import considerations
- pesticide standards for water quality
- regulation of biotechnology products
- regulation and training requirements for applicators

2. Residue analysis and monitoring

- advances in analysis methods for crops
- advances in analysis methods for soil and water
- advances in analysis methods for seafood
- sampling considerations for residue monitoring programs
- monitoring results for crops
- monitoring results for seafood
- monitoring results for soil and water

3. Risk assessment and management

- toxicological considerations for human health assessment
- chronic and acute dietary intake assessment
- measurement and mitigation of applicator exposure
- manufacturing practices to minimize worker and environmental impacts
- ecological impact assessment of pesticides
- practices to minimize pesticide waste disposal impacts
- development of pesticides with reduced risk characteristics
- government perspectives on risk management options

Workshop delegates will have the opportunity to visit laboratories engaged in pesticide residue analy-

sis, pest management, agricultural environment protection, and toxicity studies during a tour of the facilities at the TACTRI headquarters. TACTRI is on the outskirts of Taichung City, located in central Taiwan; the area has a population of one million people and is the cultural and economic heart of the central Taiwan region. Local tourist attractions include parts of the city center with Buddhist and Taoist temples, the Confucius Shrine, Cultural Center, Museums of Fine Arts and Natural Science History, as well as Sun Moon Lake and the Hsitou Forest Recreation Area.

For additional information, contact Sue-Sun Wong, Taiwan Agriculture Chemicals and Toxic Substances Research Institute, Council of Agriculture (TACTRI/COA), 11 Kung-Ming Road, Wufeng, Taichung Hsien, Taiwan; E-mail: sswong@tactri.gov.tw; Tel.: +886 4 3302101, Ext. 401; Fax: +886 4 3324738; Web site: <http://www.tactri.gov.tw/>.

Forum III of the Intergovernmental Forum on Chemical Safety (IFCS), 14–20 October 2000, Salvador, Bahia, Brazil

This meeting will conduct a full review of the organizational, administrative, and financial aspects of the IFCS Forum series of conferences, as well as an assessment of their effectiveness.

For further information, contact the IFCS, c/o World Health Organization, 20 Avenue Appia, CH-1211 Geneva 27, Switzerland; E-mail: ifcs@who.ch; Tel.: +41 22 791 4333 or +41 22 791 3650; Fax: +41 22 791 4875; Web site: <http://www.ifcs.ch/>.

Conference Calendar

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

NEW designates a new conference since the last issue.

2000

Bio-Organic Chemistry

30 January–4 February 2000
5th IUPAC Symposium on Bio-Organic Chemistry (ISBOC-V), Pune, India.
Prof. S. Ranganathan, Discovery Laboratory, Indian Institute of Chemical Technology, Hyderabad 500 007, India.
Fax: +91 4 717 3757
E-mail: ranganathan@iict.ap.nic.in

Materials Science

8–9 April 2000
Pre-conference Workshop
10–12 April 2000
UNESCO School and 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 XI, Matieland 7602, South Africa.
Tel: +27 21 808 3172
Fax: +27 21 808 4967

NEW

E-mail: rds@land.sun.ac.za

High-Temperature Materials Chemistry

10–14 April 2000
10th International Conference on High-Temperature Materials Chemistry, Aachen, Germany.
Prof. Klaus Hilpert, Forschungszentrum Jülich GmbH, Institut für Werkstoffe der Energietechnik (IWE 1), 52425 Jülich, Germany.
Tel.: +49 2461 61 3280
Fax: +49 2461 61 3699
E-mail: k.hilpert@fz-juelich.de

How to Apply for IUPAC Sponsorship

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

Mycotoxins and Phycotoxins

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

Polymer-Based Technology

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

Flow Analysis

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

Chemical Sensors

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

Organic Synthesis

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

Physical Organic Chemistry

8–13 July 2000
15th International Conference on Physical Organic Chemistry (ICPOC 15), Göteborg, Sweden.
Prof. P. Ahlberg, Organic Chemistry, Department of Chemistry, Göteborg University, SE-412 96, Göteborg, Sweden.
Tel.: +46 31 7722900
Fax: +46 31 7723843
E-mail: Per.Ahlberg@oc.chalmers.se

Macromolecules

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

Coordination Chemistry

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

Polymers in Medicine

17–20 July 2000
40th Microsymposium Polymers in Medicine, Prague, Czech Republic.
Dr. Jaromir Lukas, Institute of Macromolecular Chemistry, Academy of Science of the Czech Republic, Heyrovského nam. 2, 162 06 Praha 6, Czech Republic.
Tel.: +420 2360341
Fax: +420 2367981
E-mail: sympo@imc.cas.cz

Polymer Networks '2000

17–21 July 2000 **NEW**
15th Polymer Networks Group Meeting "Polymer Networks '2000", Cracow, Poland.
Prof. H. Galina, Rzeszow University of Technology, Faculty of Chemistry, W. Pola Str.2, PL 35-959 Rzeszow, Poland.
Tel.: +48 17 628 057
Fax: +48 17 854 3655
E-mail: hgal@prz.rzeszow

Photochemistry

22–27 July 2000
18th IUPAC Symposium on Photochemistry, "Photochemistry into the New Century", Dresden, Germany.
Prof. Dr. Silvia E. Braslavsky, Max-Planck Institut fuer Strahlenchemie, Postfach 101365, D-45413 Muelheim an der Ruhr, Germany.
Tel: +49 (208) 306 3681
Fax: +49 (208) 306 3951
E-mail: braslavskys@mpi-muelheim.mpg.de

Organometallic Chemistry

23–28 July 2000

19th International Conference on Organometallic Chemistry (XIX ICOMC), Shanghai, China.

Profs. Li Xin Dai and Chang Tao Qian, Chairmen, Prof. Xue Long Hou, Secretary, Shanghai

Institute of Organic Chemistry, Chinese Academy of Sciences, 354 Fenglin Road, Shanghai 200032, PR, China,

Tel.: +86 21 641 63300

Fax: +86 21 641 66128

E-mail: xlhou@pub.sioc.ac.cn

Solubility Phenomena

25–28 July 2000

9th International Symposium on Solubility Phenomena (9th ISSP), Hammamet, Tunisia.

Prof. Najia Kbir-Arigoib, National Institute for Scientific and Technical Research, P.O. Box 95, Hammam-Lif, 2050 Tunisia.

Tel.: +216 1 430 215

Fax: +216 1 430 934

E-mail: arigoib@planet.tn

Chemical Education

5–10 August 2000

16th International Conference on Chemical Education: Chemistry for a Healthier Planet (16 ICCE), Budapest, Hungary.

Prof. Alajos Kalman, Chairman, Prof. Gabor Naray-Szabo, Department of Theoretical Chemistry, Lorand Eotvos University, Pazmany Peter st. 1b, H-1117 Budapest, Hungary.

Tel.: +36 1 209 0555, ext. 16-30

Fax: +36 1 209 0602

E-mail: mail2.mke@mtesz.hu

Chemical Thermodynamics

6–11 August 2000

16th IUPAC Conference on Chemical Thermodynamics, Halifax, Nova Scotia, Canada.

Prof. M. A. White, Department of Chemistry, Dalhousie University, Halifax, Nova Scotia B3H 4J3, Canada.

Tel.: +1 902 494 3894

Fax: +1 902 494 1310

E-mail:

Mary.Anne.White@DAL.CA

Thermal Analysis and Calorimetry

14–18 August 2000

12th International Congress on Thermal Analysis and Calorimetry, Copenhagen, Denmark.

Dr. O. Toft Sorensen, Materials Research Department, Riso National Laboratory DK-4000, Roskilde, Denmark.

Tel.: +45 4677 5800

Fax: +45 4677 5758

E-mail: o.toft.sorensen@risoe.dk

Biotechnology

3–8 September 2000

11th International Biotechnology Symposium, Berlin, Germany.

Prof. G. Kreysa, DECHEMA e.V.—c/o 11th IBS, Theodor-Heuss-Allee 25, 60486 Frankfurt/Main, Germany.

Tel.: +49 69 7564 235 / -249

Fax: +49 69 7564 176 / -304

E-mail:

biotechnology2000@dechema.de

Nuclear and Radiochemistry

3–8 September 2000

5th International Conference on Nuclear and Radiochemistry (NRC5), Pontresina, Switzerland.

Prof. H. W. Gäggeler, Chairman, Mrs. R. Lorenzen, Secretary, Paul Scherrer Institut, CH-5232 Villigen-Ost, Switzerland.

Tel.: +41 56 310 2401

Fax: +41 56 310 4435

E-mail: ruth.lorenzen@psi.ch

Analytical Chemistry

3–9 September 2000

EUROANALYSIS XI, Lisboa, Portugal.

Prof. Maria Filomena Camões, Chair, Dr. Cristina Oliveira, Secretary, Departamento de Química e Bioquímica, Faculdade

de Ciências, Universidade de Lisboa, Edifício C1-5º Piso, P-1700 Lisboa, Portugal.

Tel.: +351 1 3906138

Fax: +351 1 3909352; 7500088

E-mail: euroanalysisxi@fc.ul.pt

Natural Products

4–8 September 2000

22nd International Symposium on the Chemistry of Natural Products, Sao Paulo, Brazil.

Dr. M. Fátima das G.F. da Silva, Universidade Federal de Sao Carlos, Depto. de Química, Via Washington Luiz, km 235, CP676, Sao Carlos, Sao Paulo, Brazil.

Tel.: +55 16 274 8208

Fax: +55 16 274 8350

E-mail: dmfs@power.ufscar.br

Medicinal Chemistry

18–22 September 2000

XVI International Symposium on Medicinal Chemistry, Bologna, Italy.

Prof. C. Melchiorre, Università di Bologna, Dipartimento di Scienze Farmaceutiche, Via Belmeloro 6, I-40126 Bologna, Italy.

Tel.: +39 051 259 706

Fax: +39 051 259 734

E-mail: camelch@alma.unibo.it

Trace Elements in Food

9–11 October 2000

Warsaw, Poland.

Prof. B. Szeke, Chairman, Dr. R. Jedrzejczak, Secretary, Institute of Agricultural and Food Biotechnology

ul. Rakowiecka 36

02-532 Warsaw, Poland.

Tel.: +48 22 606 3876

Fax: +48 22 4904 28

E-mail: jedrzejczak@ibprs.waw.pl

Food Packaging

8–10 November 2000

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

Dr. L. Contor, ILSI Europe, 83,

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

Polymers

20–24 November 2000
7th Latin-American Symposium on Polymers (SLAP'2000) and 5th Ibero American Congress on Polymers, Havana, Cuba.
Dr. Ricardo Martínez, Dr. Waldo Argüelles-Monal, IMRE, Universidad de La Habana La Habana 10400, Cuba.
Fax: +53 7 33 42 47
E-mail: slap@imre.oc.uh.cu

2001

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. Nunez Selles, 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@infomed.sld.cu

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

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

1–5 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

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: yoshiff@mail.cc.tohoku.ac.jp

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

Biodiversity

3–8 November 2001
3rd IUPAC International Conference on Biodiversity (ICOB-3), Antalya, Turkey.

Prof. B. Sener, Department of Phamacognosy, 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

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

Visas

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