News of the Environmental Chemistry Group (ECG)

Suggestions for Future ECG Meetings - A Request from the Chairman of the ECG

This is the first Newsletter to be produced since my election as Chairman of the Environmental Chemistry Group's Committee and it is a privilege to be able to reach all 2,100 members of the Group directly in this way.

Our Committee has a very clear purpose:

To further the interests of environmental chemists and environmental chemistry, both within and outside the Royal Society of Chemistry.

It aims to do this by representing the views of its members wherever possible, by organising symposia on topical and technical issues, by disseminating information through the Newsletter and by acting as a focus for environmental chemistry in the UK.

I believe our success is demonstrated by the strength of our symposia programme over the last few years, and with at least half a dozen meetings at an advanced stage of preparation we can confidently look forward to a continuation of this success. The resources available to the Committee (particularly time!) are naturally limited, but of course we could do more and I would welcome suggestions on what, when, where and how we should devote our collective efforts.

Nick Hewitt

University of Lancaster

ECG Essay Competition

The winners of the 1995 ECG competition were Mr Jason Gibb, who won the Bechtel Prize for the 25 years and under age category, and Ms Fiona Dickson who was awarded the ICI plc prize in the 26-32 year age group. The winning entries were entitled *Novel Approaches to Ecological Risk Assessment* and *The Current and Future Roles of Chemistry in Radioactive Waste Management* respectively. The two £200 prizes were presented during this year's Distinguished Guest Lecture in London.

The theme for this year's ECG Essay competition is 'Chlorine - A Controversial Essential Element'. How can a knowledge of environmental chemistry be used to illuminate the debate concerning the environmental impact of chlorine-containing chemical species?

You may find that it is preferable to concentrate on a specific example of chlorine chemistry to illustrate your essay. Topics such as (a) the role of chlorine in stratospheric ozone change; (b) the role of chlorine in water purification; (c) the formation and destruction of dioxins, are just three examples of the fascinating interplay between environmental chemical reactions and possible perturbations to the natural system.

Your essay should not exceed 2000 words and again there are two prizes each of £200 - one to the best entry from members 25 or less, and the other to the best entry in the 25-32 year age group. The prizes are sponsored by Bechtel Ltd and ICI plc.

All those who enter the competition will be awarded free membership of the Environmental Chemistry Group for 1997, and the two winners will be invited to the AGM/Distinguished

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Guest Lecture on Tuesday March 4th 1997 to receive their prizes.

Entries for the 1996 ECG Essay Competition, together with your date of birth, should be sent by the closing date December 14th 1996 to the Secretary of the ECG: Dr Mike Jenkin, AEA Technology (NETCEN), E5, 16 Culham, Abingdon, Oxfordshire OX14 3DB.

ECG Newsletter on the Internet

A reminder that the current issue of the ECG Newsletter may be seen on the RSC's home page on the Internet. The RSC's address is:

http://chemistry.rsc.org/rsc.

Once connected, the Newsletter may be found by clicking, in succession, : divisional activities - Interdivisional - Environmental Chemistry. Alternatively, the Newsletter may be seen directly at:

http://chemistry.rsc.org/rsc/ecg.htm.

Issues in Environmental Science and Technology at Half-Price

The RSC review series, *Issues in Environmental Science and Technology*, was described in the last issue of this Newsletter. The two most recent volumes (4 & 5) are *Volatile Organic Compounds in the Atmosphere* (1995) and *Agricultural Chemicals and the Environment* (1996). We are pleased to announce that the RSC have agreed to sell *Issues in Environmental Science and Technology* to members of the RSC's Environmental Chemistry Group at half-price (£7.50 per issue at current prices). Contact the Sales and Promotion Department at the RSC on 01223 420066 for details.

1997 Environmental Chemistry Group Distinguished Guest Lecture

The 1997 ECG Distinguished Guest Lecture will be given by Dr. Dick Derwent of the Meteorological Office, and will be held on **Tuesday 4 March 1997** at the Royal Society, Carlton House Terrace, London SW1. The theme of Dr. Derwent's talk will be "Atmospheric Chemistry and Climate Change", and it will be accompanied by two further presentations on topics related to climate change. The full programme will commence at 2.00 pm, and is scheduled to include the ECG AGM.

Further details will be published in the next issue of this Newsletter.

RSC Environmental Chemistry Group Officers (1996)

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Meeting Report - Urban Air Pollution

The RSC's Environmental Chemistry Group and Industrial Affairs Division jointly held a half-day symposium on March 7th 1996 in London on the theme of Urban Air Pollution. At the meeting **Professor Roy Harrison**, Birmingham University, the winner of the **John Jeyes Award** for 1995/1996 gave this year's ECG Distinguished Guest Lecture, combined with his John Jeyes Lecture, on **The Chemistry of Urban Pollution**, while in two complementary talks, **Dr David Hendrick**, Newcastle University spoke on **The Medical Effects of Urban Air Pollution, and Dr Martin Williams**, DoE London, reviewed the Department's research programme on urban air pollution.

The Chemistry of Urban Air Pollution

Professor Harrison described the origins of the major pollutants in the urban atmosphere, some of the chemistry which controls secondary pollutants, and current concerns of the health effects of particulates in urban air.

Past decades have seen a progressive shift in the sources of primary urban air pollutants from smoke and sulphur dioxide generated from the burning of coal in domestic premises to vehicle-generated pollutants. In particular, the pollutants carbon monoxide, hydrocarbons (such as the chemical carcinogens benzene and 1,3-butadiene), nitrogen oxides and particulate matter in urban areas arise very substantially from road traffic emissions, even though the inventories of national emissions show very significant contributions of other sources in relation to some of these pollutants (*e.g.* hydrocarbons). Secondary pollutants are those formed by chemical processes in the atmosphere and include tropospheric ozone, nitrogen dioxide and a proportion of airborne particulate matter.

Temporal trends in urban air quality show that in London airborne concentrations of smoke and sulphur dioxide have fallen very much faster in the past 25 years than the national emissions, reflecting the importance of low level combustion of coal in past years in our cities. In the case of lead, concentrations in central London air have fallen at a rate commensurate with the reduced use of lead in petrol. In the case of nitrogen dioxide no significant trend is evident in central London in either the annual mean or 98th percentile between 1976 and 1994. For most other pollutants, the time series of urban measurements are too short to discern trends clearly.

Some of the most important air pollution problems relate to secondary pollutants formed within the atmosphere. The controls on chemical change in urban air can be summarised under three headings:

(a)*Atmospheric mixing when the chemistry is very fast.* An example of a system controlled by atmospheric mixing is the production of nitrogen dioxide from oxidation of nitric oxide by ozone close to road traffic.

(b)*Chemical thermodynamics for rapidly reversible reaction systems.* An example is the reaction of ammonia with nitric acid vapour to form ammonium nitrate particles which, despite some kinetic limitations, is a system close to equilibrium in the UK urban atmosphere.

(c)*Chemical and photochemical kinetics.* Reaction kinetics determine the production of ozone in ground level air [$NO_2 + h\upsilon \rightarrow NO + O(^3P)$ $\lambda<435nm$; $O(^3P) + O_2 + M \rightarrow O_3 + M$]. Ozone typically has a summer concentration maximum in an urban plume downwind from a major source of precursor emissions. A further example of kinetics influencing the concentration of an urban pollutant is the photolysis of nitrous acid. This species, which is an important source of the hydroxyl radical, builds up overnight due to the reaction of nitrogen dioxide with water vapour on surfaces, and is rapidly lost in the morning due to photolysis. The hydroxyl radical which is formed in this process and also from the photolysis of ozone at short wavelengths, is responsible for the production of nitrate and sulphate particles in the atmosphere as well as removal of many species including most hydrocarbons.

Nitrogen dioxide is an interesting example of a secondary pollutant, most of which is formed in the atmosphere by reaction of nitric oxide emitted from high temperature combustion with ozone. The relationship of hourly mean nitrogen dioxide to hourly mean NO_x (the sum of $NO + NO_2$) concentrations at central urban sites is highly non-linear. It shows three regions corresponding to NO_x limitation at very low concentrations where ozone exceeds NO_x, a plateau region at intermediate concentrations where the NO_2 production is limited by the availability of ozone, and a near-exponential region at high NO_x concentrations where NO_2 rises very rapidly due to the intervention of other oxidation mechanisms involving reaction of nitric oxide with molecular oxygen.

The pollutant currently stimulating most interest in relation to health effects is particulate matter, measured in the U.K. urban atmosphere as PM_{10} (airborne particles with a size expressed as aerodynamic diameter of

less than 10 micrometres). PM_{10} has a range of sources, but in U.K. urban air the major contributors are primary emissions from road traffic and secondary particles formed from oxidation of SO_2 and NO_x. Winter urban concentrations of PM_{10} correlate closely with carbon monoxide which is known to be generated almost wholly from road traffic.

Concerns over the health effects of PM_{10} are based upon two kinds of study. Time series studies involve the correlation of an adverse health outcome such as mortality over periods of 24 hours with airborne particulate matter concentrations over the same 24 hours, or lagged by up to three days, after controlling for potentially confounding influences such as atmospheric temperature. These studies indicate that a $10\mu gm^{-3}$ increase in PM_{10} corresponds approximately to 1% increase in daily mortality, and a substantially greater increase in lesser health outcomes such as the aggravation of symptoms in asthmatics. The cross-sectional studies such as the Harvard Six Cities Study have sought to relate mortality rates in different cities to the air pollution concentrations in those cities after making allowance for personal risk factors in the people studied. These have shown major reductions in life expectancy in cities with the highest concentrations of airborne PM_{10}, but historical air pollution and socio-economic factors may also play a role.

In the U.K. atmosphere, fine particle concentrations (defined as particles less than 2.5μm aerodynamic diameter) correlate closely with NO_x indicating a road traffic source, and the chemical composition reflects the presence of emissions from road vehicles and secondary sulphates and nitrates. Coarse particles (defined as those in the range 2.5-10μm) are far more prevalent in summer than winter and have a chemical composition indicating that the major source is the resuspension of surface road dusts and soils. Further size discrimination of airborne particles in Birmingham has shown that the peak in number concentration occurs at around 30 nm diameter corresponding closely to the peak in alveolar deposition in the human respiratory system.

In conclusion, whilst motor vehicles are the main source of most urban air pollutants, concentrations of the majority of such pollutants are declining and will continue to fall for some years to come. Secondary pollutants such as ozone, nitrogen dioxide and secondary PM_{10} continue to present a problem and there is much work yet to be done in fully understanding the chemical processes responsible for controlling the concentrations of these important pollutants.

Medical Effects of Urban Air Pollution

Background

The adverse medical effects of urban air pollution were dramatically demonstrated by the notorious London fog of December 1952 when 3,500-4,000 excess deaths occurred as a direct consequence of 5 days of stable (and stagnant) weather conditions and accumulating emissions from burning fossil fuels, particularly coal. Mean concentrations of smoke and sulphur dioxide increased 7-9 fold and the emergency medical services were overwhelmed. Deaths occurred chiefly in the elderly and in those with preexisting life threatening diseases, and were largely a consequence of chronic obstructive pulmonary disease (COPD) and cardiovascular events (heart attacks and strokes). Similar 'epidemics' have occurred in other industrial conurbations, prompting clean air legislation in many countries and marked improvements in urban air quality over the following decades. These favourable trends, aided by fuel changes from coal to natural gas, have continued with the exception of urban air pollution attributable to vehicle emissions. Current concerns are consequently directed to small particulates, oxides of nitrogen, carbon monoxide, and volatile organic compounds which are emitted from the increasing number of vehicles, particularly those with diesel engines, and to the effects these urban pollutants exert on distant rural concentrations of ozone.

Spectrum of Medical Effects

The lungs provide the primary interface between the body and the atmosphere, and they act both as a portal of entry for harmful air pollutants and as a target. Lead, carbon monoxide, and benzene, for example, are absorbed into the blood and circulated round the body to pose hazards to the brain, nerve cells, bone marrow, gut, and the arterial tree. Ultrafine particulates are absorbed into the interstitium of the lung, and are thought to play a critical role in activating inflammatory cells, stimulating blood coagulation, and provoking thromboses in atherosclerotic cerebral or coronary arteries. This results in heart attacks and strokes. Particulates may also damage the lungs themselves, as may oxides of nitrogen, ozone, sulphur dioxide, acid aerosols, and volatile organic compounds. The principal effects are related to asthma, COPD, and chronic bronchitis (and possibly lung cancer), but there is much uncertainty and controversy. All these disorders occur commonly, even in the absence of urban air pollution, and it is not easy to identify their relationships with individual urban air pollutants when, inevitably, several different pollutants are generated together and dispersed together in the urban environment.

Asthma, COPD, and Chronic Bronchitis

The prevalence of asthma appears to be increasing and it is tempting to incriminate increasing urban air pollution from vehicle emissions. Current evidence does not favour this, however, though it is clear that urban air pollution does exacerbate asthma temporarily in those who are already affected, and that certain urban aeroallergens (eg soy bean dust in grain ports) can both cause and exacerbate asthma - possibly through interactions with oxidant air pollutants.

A similar situation exists with COPD, there being no consensus at present whether urban air pollution is a causal factor. COPD is readily exacerbated by intercurrent viral infections and by the particularly high levels of urban air pollution which are associated with prolonged periods of air stagnation. It is now conventional to use the term chronic bronchitis to describe long standing productive cough, irrespective of there being airway obstruction (ie COPD). The two are most commonly caused by cigarette smoking and commonly occur together, but this is not necessarily so. Persistent productive cough is a non specific consequence of regular exposure to many airborne irritants, and is being described increasingly in many occupational environments where there are airborne dusts or fumes, or chemicals dispersed as aerosols, gases or vapours. Urban air pollution is consequently a plausible, indeed accepted, cause of chronic bronchitis, not merely an exacerbating factor.

The DoE View of Urban Air Pollution

Dr. Martin Williams, the head of the Technical Policy Branch of the Air and Environmental Quality Division at the Department of the Environment (DoE), presented an overview of the Department's air quality research programme. He described, in particular, the contribution to urban air pollution made by motor vehicle emissions, and summarised the behaviour and impact of major pollutants such as particulate matter, oxides of nitrogen and ozone. He went on to present data from the automatic urban and rural monitoring networks, and described how such data, together with air quality forecasts, are disseminated and constantly updated *via* teletext services. He also explained the role of the expert review groups of both the Department of the Environment and the Department of Health in appraising such data, establishing air quality criteria and formulating recommendations for improving air quality.

[Roy Harrison is The Queen Elizabeth II Birmingham Centenary Professor of Environmental Health and Director of the Institute of Public and Environmental Health at the University of Birmingham. Professor Harrison's recent publications for the RSC include *Pollution: Causes, Effects, and Controls*, 3rd edition, 1996 and *Understanding Our Environment: An Introduction to Environmental Chemistry and Pollution*, 2nd edition, 1992. Together with Professor Ron Hester of the University of York he edits the RSC review series *Issues in Environmental Science and Technology* which was described in the third issue of this Newsletter. Dr D.J. Hendrick MD FRCP FFOM, is a Consultant Physician, at the Newcastle General Hospital, Westgate Road, Newcastle upon Tyne NE4 6BE. The ECG thanks Professor Harrison and Dr Hendrick for providing summaries of their talks].

Environmental Chemistry at the University of Edinburgh

It was as long ago as 1974 that the University of Edinburgh established a **B.Sc. Honours Degree in Environmental Chemistry**. The original intention in developing this 4-year course in the Department of Chemistry was to meet the need for scientists with a basic grounding in a physical science but with special skills and awareness suited to the increasing opportunities in the environmental arena. The ultimate objective was, and continues to be, the production of a graduate who is both a qualified chemist, in the traditional sense, and an environmental specialist equipped for career opportunities in monitoring and assessment, analysis, research, industry, private consultancy and public service, contributing towards solutions of problems and greater understanding of the world about us.

We have been successful in our aims and graduates (over 250 to date) from our Environmental Chemistry degree programme, which is fully accredited by the Royal Society of Chemistry, have found acceptance in a wide range of agencies, employing their skills in environments as diverse as the heavily contaminated land of former steelworks and the near-pristine conditions of the Antarctic ice sheets.

Building upon the solid foundation of the B.Sc., a 1-year postgraduate **M.Sc./Diploma in Environmental Chemistry** was offered for the first time in 1993. This course, which is recognised by the Natural Environmental Research Council, is intended for students proficient in undergraduate chemistry who wish to specialise as environmental chemists and also apply their chemical education to the principles and practices of environmental control. With typically a dozen students per year thus far, it is proving attractive to Honours Degree chemists from the UK and overseas, environmental scientists and others with a strong chemical background, and mature graduates currently employed in the chemical industry or in environmental consultancy.

Now a new undergraduate programme leading to the degree of **Master of Chemistry in Environmental**

Chemistry has been launched, with the first crop of graduates scheduled for 1999. The programme (as in Chemistry itself) is designed for the aspiring practising scientist and will require an additional year of study (ie. five years). This is in line with recent widespread moves in Departments of Chemistry throughout the UK, endorsed by the Royal Society of Chemistry, to introduce extended Master of Chemistry degrees in response to changes in the school syllabus and developments in the science itself. As with the B.Sc., variants incorporating a Year in Europe or Industrial Experience are possible.

B.Sc

The Honours Degree, with the final year very much the year of specialisation in environmental chemistry, adheres to the traditional Scottish pattern in requiring four years of study. In the first three years, the Environmental Chemist follows essentially the same chemistry course as an Honours Chemist but a major strength of the Edinburgh Environmental Chemistry degree lies in the availability of an unusually high number of specialist support courses which may be taken during the first two years and provide the necessary breadth of knowledge of many disciplines vital to the Environmental Chemist. This means that the Edinburgh Honours Environmental Chemist will, after two years, have studied between four and six subjects other than chemistry, as dictated largely by his or her preference.

The normal First Year consists of Chemistry with either Geology or Mathematics, or Physics and Mathematics, or courses in Biology. In Second Year, two other courses or combinations of half-courses, including the half-course in Environmental Chemistry, are combined with second year Chemistry. The Third Year is exclusively Chemistry, incorporating analytical/environmental chemistry topics. The Honours Year includes lecture courses on topics such as atmospheric chemistry, aquatic chemistry, geochemistry, environmental change, environmental modelling, atmospheric modelling, environmental radioactivity, catalysis and pollution control, industrial chemistry, chemical evolution, heavy metals, food chemistry, chemical carcinogens, pesticide chemistry, free radicals, colloids, bioinorganic chemistry, chemical aspects of biotechnology etc. In addition, students, who have received an intensive training in the chemistry laboratories during the first three years, carry out a research project over two terms. Examples of projects recently undertaken include the study of Chernobyl radioactivity in Scotland's soils, lead pollution and health, eutrophication and heavy metal contamination of freshwater lakes, the ecological impact of acid precipitation, the determination of peroxyacetylnitrate in air, humic acid banding in coral reefs, electrochemical conversion of solar energy, and the preparation of low-cost carbon adsorbents.

M.Chem

The M.Chem will share a common first three years with the B.Sc. Honours Degree. Thereafter, the principal structural differences will be additional lectures, three 6-week Research Methods exercises in Fourth Year, and a significantly extended period for the Research Project in Fifth Year. The first students on the course will be those currently in Second Year who have chosen to switch to the M.Chem. and will therefore enter the Fourth Year of the M.Chem. programme in session 1997-98.

M.Sc

The course, deploying both internal staff and practitioners from external bodies, is 12 months full-time and consists of a two-term (20-week) taught programme (October-March) and a 6-month research project (April-September). The taught part of the course, sectioned into six key areas of study (atmospheric chemistry, aquatic chemistry, terrestrial chemistry, chemical pollution control and remediation, environmental biochemistry, and environmental toxicology and health) includes lectures (150, featuring topics such as tropospheric pollution, contaminated land, risk assessment etc.), workshops/tutorials, case studies, practical placements (internal and external) and site visits. Additional coursework includes written and oral assignments.

Assuming a satisfactory performance in coursework and April examinations, students then go on to carry out their research projects wholly inside or outside the Department of Chemistry (eg. with an industrial firm, research institute, environmental consultancy) or via an agreed combination of the two. Examples of projects undertaken include the behaviour of mercury in estuarine waters, treatment methods for residual metals reduction in the combined wastewaters from a chemical plant, investigation of the biodegradation state and leachate quality of landfill sites, analytical strategies for soils contaminated with PAHs, and the determination of carbonyl compounds and hydrocarbons in the atmosphere.

Research

Underpinning much of the above research project activity at the advanced undergraduate and postgraduate levels is the Environmental Chemistry Unit, which, in collaboration with relevant industrial, consultancy and research institute partners, is engaged in both field- and laboratory-based studies on sources, reactions, pathways, sinks, impact and measurement of heavy metals, radionuclides, nutrients, organic compounds and gaseous pollutants in atmospheric, aquatic, terrestrial and biospheric systems, with particular emphasis upon the troposphere, coastal marine and freshwater lake sediments, soils and humans.

Specific current work of the Biogeochemistry Group (led by John Farmer and Margaret Graham) includes ICP-MS characterisation of environmental lead contamination, the use of stable isotopes as tracers of environmental processes, the development and application of bioassays for assessment of metal-contaminated land, the LIF and solid state NMR characterisation of humic substances and their interactions with actinides, and for the Atmospheric Chemistry Group (led by Mat Heal), techniques for field measurement of tropospheric VOC and NO_y species, in addition to laboratory spectroscopic and kinetic studies of atmospheric radical species.

For further information on any of the above, please contact Dr. John Farmer, Director, Environmental Chemistry Unit, Department of Chemistry, The University of Edinburgh, West Mains Road, Edinburgh, EH9 3JJ tel: 0131 650 1000; email JGFarmer@uk.ac.edinburgh

The Royal Society of Chemistry's Register of Eco-Audit Specialists

New legislation, consumer pressure, and a growing demand for ethical investment have resulted in an increased awareness within the industrial section of the impact of their activities on the environment.

As part of the progress towards a cohesive environmental policy, the European Union (EU) introduced the Eco-Management and Audit Scheme Regulation (EMAS) in 1993.

The EMAS Regulation, which aims to secure a continuous and long-term improvement in environmental performance throughout European industry, was launched as a voluntary initiative in the UK in April 1995. EMAS is designed to provide recognition for organizations who have established a programme of positive action to protect the environment, and who seek improvements through a clearly defined strategy for environmental management. The basic scheme relies on a system of registration which is granted on a site-by-site basis rather than to an organisation as a whole. Under EMAS an organisation's environmental policy and environmental management system are audited, and a site-specific environmental statement must be verified by an independent verifier.

EMAS encompasses the existing British Standard for environmental management systems (BS 7750). In addition EMAS requires independent verification of a site's compliance and the production of an environmental statement.

In order to help smaller companies (defined as those with less than 250 employees world-wide and an annual turnover of less than £16 million) establish a recognised environmental management system and register their site(s) under EMAS, the UK's Department of the Environment have devised SCEEMAS - the Small Company Environmental and Energy Management Assistance Scheme. SCEEMAS provides up to 50% of the cost of hiring experts to guide small companies to EMAS registration. However, SCEEMAS does not cover the cost of certification to BS 7750.

The Royal Society of Chemistry (RSC) has initiated a Register of Eco-Audit Specialists for its chartered chemists in response to the introduction of EMAS. The purpose of the Society's Register is to identify those members who are competent to perform audits under EMAS.

For admission to the Register, RSC members should have had a minimum of two years experience in environmental auditing encompassing some or all of the following areas of professional responsibility: internal environmental reviews, environmental audits, the establishment, maintenance or implementation of environmental management systems, or comparable areas of responsibility in the development of company environmental policy. The required experience to join the RSC's Register may be gained either through self-employment, or through working in the private, or state sectors, or for environmental consultants.

Several oral assessments for admission to the Society's Register of Eco-Audit Specialists have been completed since the beginning of 1996, and the following RSC Members have been admitted to the Register:

Dr P. R. M. Dare, Manager Safety & Environmental Services, Severn Trent Laboratories

Mr R. W. Matthews, Manager, Chemical & Environmental Services, The Royal Mint

Mr D. Sayers, Consultants 2000

Dr A. L. Smith, Health, Safety & Environment Manager, McDermott Engineering (Europe) Ltd

Dr T. M. Stafford, Inspector, Environmental Protection Agency, Ireland.

Several other applications are currently receiving consideration.

The procedure for admission to the Eco-Audit Specialist's Register is similar to that adopted for the four other RSC Registers (Qualified

Persons; Health & Safety Specialists; Water Chemists; and Analytical Chemists). An application form giving details of work experience and academic background, together with evidence of audits carried out by the applicant and the recommendations of two sponsors, are considered by a Panel of Assessors. Following this initial documentary review, an oral assessment is then carried out. This focuses on the candidate's experience and knowledge of four specific areas:

- methods of environmental auditing
- management techniques
- current environmental issues
- environmental legislation and standards including specific guidances developed for EMAS and relevant technical knowledge.

Further details about the Register of Eco-Audit Specialists and an application form to join the Register may be obtained from Maureen McGreal, Registration Officer, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN; Tel: 0171-437-8656; email: mcgrealm@rsc.org.

For further details of EMAS see *Croner's Environmental Management*, Croner Publications, 1996.

Maureen McGreal

Environmental Chemistry at Imperial College: The Environmental Geochemistry Research Group

General Area of Research

The Environmental Geochemistry Research Group (EGRG) is part of the Centre for Environmental Technology at Imperial College, London. The work of the EGRG is concerned with the study of metals and metalloids in the environment. The techniques of environmental geochemistry and environmental chemistry are used to understand the sources, behaviour, chemical speciation, and pathways of metals and metalloids and their impact on the health of plants, animals and humans. In addition to trace metal analysis, useful tools include computerised geochemical mapping and geographical information systems (GIS), and computer controlled individual particle analysis based on scanning electron microscopy.

Attention has focused on the contamination of land from mining and metal processing and the significance of this contamination for the environment, for agriculture and for human health. Geochemical maps have shown that about 4000 km^2 of agricultural and urban land in the UK has been contaminated by lead, zinc, cadmium, copper and arsenic in mineralised areas in which historic mining and smelting activities have taken place. Present research concerns the chemical and mineral forms of inorganic contaminants in the rock-soil-water-plant-animal-human system and the influence of these forms have on the bioavailability and on the environmental pathways. The bioavailability and environmental pathways will impact on the heath risk and on remediation techniques. Some activities are briefly discussed below.

Lead from Mining and Smelting Activities

Research into lead exposure in the old lead/zinc mining area of Derbyshire has shown heavy contamination in and around homes within specific villages, with as much as 1% lead or more in garden soils. The mineral forms of the lead have been found to have changed over time, and much of the lead, originally present as galena, PbS, is now found as insoluble pyromorphite, $(PbCl)Pb_4(PO_4)_3$. This insoluble form predominates in soils, house dusts and on the hands of young children, the last being a significant route for the ingestion of lead by young children and babies. The blood lead concentrations of young children in these villages, the high end of the normal range, were not as high as might be expected from the total lead concentrations, and reflect the low bioavailability of this form of lead. This provides an example of natural remediation.

Overseas, collaborative work is being carried out with the Institute of Mining and Geology, Athens in assessing the health effects of elevated lead, cadmium and arsenic in soils from past mining and smelting activities at Lávrion, which is about 75 km south of Athens. Similar work is also being carried out in areas of the Czech Republic.

Long-term Migration

Historic lead smelting sites dating back 200-2,000 years, have been used to understand leaching over long time scales into ground waters. Downward migration has been shown to relate to metal species in the slag, soil texture and acidity. The results are being used to understand leaching from landfill

disposal of metal-rich wastes.

Arsenic from Mining Activities

Arsenic was mined and smelted locally in South West England leaving a legacy of highly contaminated urban and rural land. Current research is concerned with the extent of human exposure, establishing all routes of exposure, the chemical forms of arsenic in the soils and waste materials and their solubility and bioavailability.

Urban Pollution by Metals

Extensive studies within the urban environment have demonstrated high concentrations in urban garden soils and in house dusts. In older properties this is largely from the previous use of lead based paints. In collaboration with the British Geological Survey, a programme of urban geochemical mapping has lead to the production of computer generated maps for 25 elements based on systematic sampling in two conurbations, the London Borough of Richmond and Wolverhampton. In Richmond, the maps provide a clear indication of lead contamination on major traffic routes, while in Wolverhampton, contamination by a number of metals can be correlated with industrial use of land. Parallel investigations are being carried out in Shanghai, People's Republic of China and Delhi, India.

Recent work has also investigated the enrichment of road dusts and urban soils with platinum and palladium from vehicles which have been fitted with catalytic converters. Emphasis is being placed on the determination of the chemical forms of platinum metals in the environment and their environmental fate and possible health effects.

Current Research

Some of the other current activities of the EGRG include:

- geochemical aspects of the mineral nutrition of wildlife in Kenya with particular reference to the black rhinoceros and the Roosevelt sable.
- antimony in the urban environment and possible health effects.
- application of scanning electron microscopy for individual particle analysis to identify sources of pollutants in aerosols and dusts.
- environmental contamination arising from acid mine drainage resulting from the closure of coal mines.

Dr Margaret Farago, Environmental Geochemistry Research Group, Imperial College of Science, Technology and Medicine, Centre for Environmental Technology, Prince Consort Road, London SW7 2BP; Tel: 0171 594 6390.

Environmental Information from the Library and Information Centre (LIC) of the Royal Society of Chemistry

Many readers of this Newsletter will be familiar with the RSC's Library and Information Centre (LIC) at Burlington House, and know that it has one of the largest and most heavily used collections on chemistry and related subjects in Europe. Perhaps it is not generally appreciated that the LIC is also a leading source of information on the environment.

Of the several hundred enquiries which the LIC receives every month on all aspects of chemistry, most fall into into one of five categories: technical (*e.g.* physical/chemical properties), chemical suppliers/producers, business, health, safety and the environment, and historical. This article focuses on the environmental information which is available from the LIC.

Range of Enquiries

Enquiries on environmental issues can be very varied. Recent requests include:

- environmental impact of vanadium and its compounds
- alternatives to CFCs or HCFCs
- ozone depletion potentials of various chlorinated hydrocarbons
- Life Cycle Analysis (LCA) on selected pesticides
- definition of 'special wastes'
- information on environmental oestrogens
- ecotoxicity of selected chemicals.

Although fewer in number than chemical/hazard or toxicology enquiries, requests for environmental data are increasing. As the RSC expands its publications on environmental topics (*e.g.* the *Dictionary of Substances and their Effects (DOSE)* and the new review series *Issues in Environmental Science and Technology*), more enquiries are expected.

Information Resources

As well as an expanding printed collection on the environment, much information is also available at the LIC on CD-ROM or from on-line databases. A useful book on environmental information resources (environmental organisations, databases, printed works) is the British Library publication: *Environmental Information: a Guide to Sources*, Nigel Lees & Helen Woolston, 2nd edition, 1996.

The following general publications at the LIC contain much useful statistical data, addresses, and advice on environmental legislation:

- Environmental Health Criteria - (a series of monographs)
- Europe's Environment: the Dobris Report
- UNEP Environmental Data Report
- Environmental Data Compendium
- OECD Environmental Performance Reviews
- European Environmental Markets
- Tolley's Environmental Handbook
- Environmental Industry Yearbook
- Digest of Environmental Statistics
- The UK Environment
- EU Environment Guide
- ENDS Directory of Environmental Consultants

Environmental Legislation

Unravelling and keeping up-to-date with environmental legislation is not easy. Some of the information resources used at the LIC for this task are:

- The Croner Guides (Dangerous Substances; Environmental Management; Substances Hazardous to Health; and Waste Management)
- European Community Environment Legislation (7 Vols)
- IRPTC Legal File (International Register of Potentially Toxic Chemicals)
- CHIP legislation (Chemicals Hazard Information & Packaging for supply)
- Relevant original UK legislation, especially on water
- Manual of Environmental Policy: the EC and Britain
- UN Directory of Banned Products.

Scanning relevant journals and newsletters or being part of an appropriate committee or group is also a good way (perhaps better way!) of being informed about new regulations.

Increasingly the online database *Chemlist* is being used to find chemicals listed on various inventories worldwide. *Chemical Business Newsbase* (an RSC database on CD-ROM) is also a very valuable resource for environmental legislation, especially from the business angle.

Ecotoxicology

Another problematical area is ecotoxicology. This subject area is not as well advanced as toxicology and hence the information on it is still relatively sparse. *DOSE, the Dictionary of Substances and their Effects*, a useful source of information on ecotoxicology is now available on CD-ROM from the RSC. Other reference resources at the LIC include:

- Handbook of Ecotoxicity
- Handbook of Environmental Data on Organic Chemicals
- Handbook of Environmental Fate & Exposure Data for Organic Chemicals
- Environmental Contaminant Reference Databook
- Pesticide Manual.

A series of reports on ecotoxicology is available from the European Centre for Ecotoxicology & Toxicology of Chemicals (ECETOC), Brussels.

Electronic Sources of Environmental Information

CD-ROM resources

Of eighteen CD-ROM databases and databanks available at the LIC, four, in particular, are useful for environmental data: Environmental Chemistry Health & Safety (RSC CD-ROM); Chemical Business Newsbase (RSC CD-ROM); OSHROM; and CHEMBANK.

Online resources

Recent online searches at the LIC have used databases as diverse as Chemical Abstracts, Enviroline, Pollution Abstracts, Wasteinfo, Aqualine and Chemlist (for chemical inventories).

Internet

An increasing number of services are now being made available over the Internet. Most online databases can now be accessed *via* the Internet as well as directly over specialised datalinks. In addition, World Wide Web, (WWW) services which need special software on the user's computer, are rapidly developing. For example, organizations such as the DoE, the Environment Agency, Friends of the Earth, USEPA, HSE all have a presence on the WWW. From their 'home pages' they offer information on a very wide range of subjects.

How to Use the LIC

RSC members can either visit the LIC where access to the collections including the CD-ROM databases is free of charge, or 'phone, fax, or email their enquiry. Most enquiries from members will be dealt with free of charge; charges are only made for online database searches, considerable use of staff time, or photocopy costs. Online search results can also be delivered to your desk by email if requested.

Nigel Lees

For more details of the information services provided by the LIC, please contact ***Nigel Lees, Senior Marketing Officer****, Library and Information Centre, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, Tel: +44 (0)171 437 8656, Fax: +44 (0)171 287 9798, Email: library@rsc.org*

Young Environmental Chemists Meeting, De Montfort University, Leicester, 5 March 1996

A Young Environmental Chemists meeting was held on March 5th 1996 at De Montfort University Leicester. The meeting, sponsored by the RSC's Environmental Chemistry Group and the University's Department of Chemistry, was designed to allow environmental chemists who are studying for higher degrees to present their research work and to meet other members of their own peer group. The 1996 John Jeyes Lecture was also given at this meeting.

The meeting was very successful both in terms of the number of students who attended (84) and gave presentations (12 talks, 30 posters), and the total number of chemists (young and old) who also came to hear Professor Roy Harrison's John Jeyes Lecture (150). A second keynote lecture was given by Dr Francis Livens (Manchester) on the Environmental Chemistry of Transuranium Elements.

Sponsorship for the meeting came from Zeneca Agrochemicals, William Blythe Ltd, John Wiley, The National Rivers Authority, P.S. Analytical, British Gas, and Courtaulds Chemicals. Prizes were awarded for the three best posters.

Professor P.J. Craig, Head of Chemistry at De Montfort University introduced the meeting, and Professor R.G. Linford, Head of the School of Applied Sciences, presented the prizes. Local media interest resulted in reports of the meeting on three radio stations and in two newspapers (with photograph).

P.J. Craig, B. Colston, A. Matthews, S.H. Laurie, De Montfort University, (organising committee).

Society of Environmental Toxicology and Chemistry (SETAC)

One of the aims of this Newsletter is to inform ECG members about organisations outside the RSC whose activities in the environmental sciences are of interest. The Society of Environmental Toxicology and Chemistry (SETAC) has held joint meetings with the RSC in the past, and a brief description of its activities is appropriate.

SETAC is a professional society which promotes a multi-disciplinary approach to solving the impact of chemicals and technology on the environment. SETAC aims to foster links between academia, government and industry to gain the broadest possible view from those active in the fields of biology, chemistry and environmental sciences on issues related to environmental chemistry and toxicology. This is achieved through meetings, workshops, and publications including the peer-reviewed journal *Environmental Toxicology and Chemistry*.

The UK Branch of SETAC organises regional meetings and an annual meeting as well as allowing members the benefits of belonging to SETAC-Europe. This year's annual meeting of SETAC-UK will be at the University of Stirling on September 9-11, 1996, and the topic for the meeting is Environmental Monitoring and Assessment.

For details of how to join SETAC-UK, please write to:

Dr Stuart Marshall, Unilever Research, Port Sunlight Laboratory, Quarry Road East, Bebbington, Wirral L63 3JW, Tel: 0151 4713205, Fax: 0151 4711847.

Acronyms Used In Risk Assessment

A plethora of acronyms has emerged from the regulatory interpretation of environmental risk assessment and associated disciplines such as toxicology. A selection of the more commonly encountered acronyms is given below. A fuller explanation of many of these terms may be found in a recently published RSC book - *Environmental Impact of Chemicals: Assessment and Control*, edited by Michael Quint *et al*, Royal Society of Chemistry, Cambridge, 1996. A revised list of environmental acronyms will be published in a future edition of this Newsletter.

ACGIH: American Conference of Governmental Industrial Hygienists

ACP Advisory Committee on Pesticides

ACRE Advisory Committee on Releases to the Environment (UK)

ADI Acceptable Daily Intake

ALARA As Low as Reasonably Achievable

ALARP As Low as Reasonably Practicable

AQS Air Quality Standard

ATP Adaptation to Technical Progress (EU)

BATNEEC Best Available Technique Not Entailing Excessive Cost

BCF Bioconcentration Factor

BEO Best Environmental Option

BPEO Best Practical Environmental Option

BTF Biotransfer Factor

CDI Chronic Daily Intake

CHIP Chemicals (Hazard Information and Packaging)

CIERA Centre for Integrated Environmental Risk Assessment

CIGNS Chief Inspectors Guidance Notes (HMIP)

CLEA Contaminated Land Exposure Assessment

COMEAP Committee on Medical Effects of Air Pollution (UK)

COPC Chemicals of Potential Concern

CPL Classification, Packaging and Labelling (of Dangerous Substances Directive)

DoE Department of the Environment (UK)

DOSE Dictionary of Substances and their Effects (RSC)

EAL Environmental Assessment Level

ECDIN Environmental Chemicals Data Information Network

ECETOC European Chemical Industry Ecology & Toxicology Centre

EINECS European Inventory of Existing (Commercial) Chemical Substances

EIS Environmental Information Service (British Library)

ELINCS European List of Notified Chemical Substances

EMAS Eco-Management and Audit Scheme

EPA Environmental Protection Agency (USA)

EPAQS Expert Panel on Air Quality Standards

EQO Environmental Quality Objective

EQS Environmental Quality Standard

EU European Union

GWP Global Warming Potential

HHRAs Human Health Risk Assessments

HMIP Her Majesty's Inspectorate of Pollution

HQ Hazard Quotient

HSE Health and Safety Executive (UK)

IARC International Agency for Research on Cancer

ICRCL Interdepartmental Committee on the Redevelopment of Contaminated Land (UK)

IEI Integrated Environmental Index

IEZ Integral Environmental Zoning

IPC Integrated Pollution Control

IRIS Integrated Risk Information System (database)

LOAEL Lowest Observed Adverse Effect Level

MAC Maximum Allowable Concentration

MDI Maximum Daily Intake

MEI Maximally Exposed Individual

MEL Maximum Exposure Limit

MPF Mutagenic Potency Factor

MRL Maximum Residue Level

MTD Maximally Tolerated Dose

MTEL Maximum Tolerable Exposure Level

NEAEL No Expected Animal Effect Level

NEHEL No Expected Human Effect Level

NEL No Effect Level

NIOSH National Institute for Occupational Safety and Health (USA)

NOAEL No Observed Adverse Effect Level

NOEC No Observable Effects Concentration

NOEL No Observed Effect Level

NONS Notification of New Substances (Regulations)

NRA National Rivers Authority

NTP National Toxicology Program (USA)

OES Occupational Exposure Standard

OPA Operator Performance Appraisal

OPRA Operator and Pollution Risk Appraisal

PEC Predicted Environmental Concentration

PHA Pollution Hazard Appraisal

PNEC Predicted No Effect Concentration

PORG Photochemical Oxidants Review Group (UK)

PRAIRE Pollution Risk from Accidental Influxes to Rivers and Estuaries

PSD Pesticides Safety Directorate (UK)

QRA Quantitative Risk Assessment

QUARG Quality of Urban Air Review Group (UK)

RfD Reference Dose

RSC Royal Society of Chemistry

RTECS Registry of Toxic Effects of Chemical Substances

SCEEMAS Small Company Environmental and Energy Management Assistance Scheme

SETAC Society of Environmental Toxicology and Chemistry

SNARL Suggested No Adverse Response Level

SWQOs Statutory Water Quality Objectives (SWQOs)

TDI Tolerable Daily Intake

TLV Threshold Limit Value

TQ Tolerability Quotient

UESs Unified Emission Standards

UKAS United Kingdom Accreditation Service

UNEP United Nations Environment Programme

VOCs Volatile Organic Compounds

VSD Virtually Safe Dose

WHO World Health Organisation

Forthcoming Symposia

The following symposia and lectures on environmental topics and arranged for the latter half of 1996, have come to our attention. Details of many of these meetings have been taken, with permission, from the 'green' leaflet *Environmental Science and Technology Meetings* which is produced by the Chartered Institution of Water and Environmental Management (CIWEM) and published jointly by the CIWEM and the SCI four times a year. Copies of this leaflet (which we hope to circulate with future editions of the ECG Newsletter) may be obtained, free-of-charge from the CIWEM (0171 831 3110).

Environmental Chemicals and Health

(Messel Medal Lecture by Professor Bruce N. Ames), SCI 14/15 Belgrave Square, London, 10 July 1996.

Direct Toxicity Assessment

Organised by SETAC, at University of Luton, 15/16 July 1996. (telephone Prof. David Rawson 01582 456843 for details).

Development and the Environment

Organised by the Institute of Irrigation Studies, at Southampton University, 2, 20, 27 September 1996 (Susan Oglesby 01703 593728 for details).

Chemical Contaminant of Wastes in the Geosphere

Organised by the Geochemistry Group, at the British Geological Survey, Keyworth, Nottingham, 3, 4 September 1996 (Richard Metcalfe 0115 936 3539 for details).

Environmental Monitoring and Assessment

(SETAC-UK Annual Meeting), at University of Stirling, 9,10 11 September 1996 (Donald Baird 01786 467926 for details).

Environmental Chemistry: Clean Technology

Part of the RSC (Perkin Division) Autumn Meeting, 13 September 1996 at Brunel University (contact John Gibson, 0171 437 8656 for details).

The 6th Annual European Environment Conference

Organised by ERP Environment, at Leeds University, 16/17 September 1996 (Elaine White 01274 530408 for details).

Britain's Natural Environment: A State of the Nation Review

Organised by the Environmental Change Research Centre, at Senate House, University of London, 20 September 1996 (Dr Anson W. Mackay 0171 380 7584 for details).

Air Pollution in the United Kingdom

Organised by the RSC Environmental Chemistry Group and NW Region Analytical Division, at Lancaster University, 23 September 1996 (Prof. C.N. Hewitt 01524 593931 for details).

The Environmental Management of Mining Operations

Organised by IBC UK Conferences, Scientific Societies Lecture Theatre, London, 23/24 September 1996 (0171 637 4383 for details).

BATNEEC III

Organised by IChemE North Western Branch and the RSC Environmental Chemistry Group *inter alia*, at UMIST, Manchester, 24/25 September 1996 (T. Thompson 0151 427 1596 for details).

Risk Assessment and Perception for Contaminated Land and Landfill

Organised by SCI Environment & Water Group, SCI, 14/15 Belgrave Square, 30 October 1996 (0171 235 3681 for details).

Current Research Trends in UK Air Quality

(Young Scientists Research Symposium), organised by the SCI Environment & Water Group, SCI, 14/15 Belgrave Square, 3 December 1996 (0171 235 3681 for details).

Recent Books on the Environment at the RSC Library

The following books and monographs on environmental topics have been acquired by the RSC library, Burlington House, during the period January - May 1996. Some recent additions on toxicology are also included in this list.

Barbour Index Water Quality Microfile

(Index valid until end March 1996), Windsor, Barbour Index, 1995, 123 pp. Accession No: 960013 Reference Shelves REF 014.3:628.1 R

Brief History of Pollution

Markham, A., London, Earthscan Publications, 1996, 162 pp., Accession No: 960305 West Gallery 94:504.054

Cassarett & Doull's Toxicology: The Basic Science of Poisons, 5th edition

Klaassen, C.D. (ed.), New York, McGraw-Hill, 1995, 1111 pp. Accession No: 960116 Reference Shelves, REF 615.9 R

CEFIC Guidelines on Environmental Reporting for the European Chemical Industry

Brussels, CEFIC, 1993, 17 pp. Accession No: 60106 Reading Room 061.5:66

Chemical Warfare Agents: Toxicology and Treatment

Marrs, T.C. *et al*, Chichester, John Wiley & Sons, 1996, 243 pp. Accession No: 960304 West Gallery 623.459:615.9

Cleaner Industrial Production: UNIDO Funded Demonstration Projects

Geneva, UNIDO, 1996, 20 pp. Accession No: 960214 Reference Shelves REF 66:628.5 R

Croner's Environmental Management

Kingston, Croner Publications, 1996, Accession No: 960269 Reference Shelves REF 628.5:658 R

Cryptosporidium in Water Supplies: Second Report of the Group of Experts

London, HMSO, 1995, ISBN:0117531367 108 pp. Accession No: 960231, West Gallery 644.61

Elements on Earth: Inorganic Chemistry in the Environment

Cox, P.A., Oxford, Oxford University Press, 1995, 287 pp. Accession No: 960244 Reading Room 546

Environment Industry Yearbook 1996

4th edition, London, Macmillan Environmental Press,1995, 560 pp. Accession No: 960159 Reference Shelves, REF 058:628.5 R

Environmental Analysis

Reeve, R.N., Chichester, John Wiley, 1994, 263 pp., Accession No: 960283 Reading Room 543:628.5

Environmental Contaminent Reference Databook: Vol 1

Prager, J.C., New York, Van Nostrand Reinhold, 1995, 1240 pp. Accession No: 960183 Reference Shelves, REF 628.5:661 R

Environmental Contaminant Reference Databook: Vol 2

Prager, J.C., New York, Van Nostrand Reinhold, 1995, 1292 pp. Accession No: 960184 Reference Shelves REF 628.5:661 R

Environmental Protection (Prescribed Processes and Substances) (Amendment) Regulations 1995

London, HMSO, 1995, 7 pp. Accession No: 960228 A 100 SI 1995/3247

Environmental Reporting

Second Edition, London, CIA, 1992, 7 pp. Accession No: 960080 Reading Room 061.5:66

Europe's Environment: Statistical Compendium for the Dobris Assessment

Brussels, Commission of European Communities, 1995, 455 pp. Accession No: 960158 Reference Shelves REF 628.5(4) R

Guidance on Safety, Occupational Health and Environmental Protection Auditing: Responsible Care

London, CIA, 1991 62 pp. Accession No: 960066 Reading Room 061.5:66

Investors' Environmental Guidelines: Bulgaria, Czech Republic and Slovak Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania

London, European Bank, 1993, 540 pp. (Environmental Library No.1 Accession No: 960041 Reference Shelves REF 328.34:628.5 R

Isophorone

Geneva, WHO, 1995, 84 pp. (Environmental Health Criteria No. 174) Accession No: 960323 Reference Shelves REF 66.062:628.5 R

Linear Alkylbenzene Sulfonates and Related Compounds

Geneva, WHO, 1996, 328 pp. (Environmental Health Criteria No. 169) Accession No: 960320 Reference Shelves REF 661.185.22:628.5 R

Methomyl

Geneva, WHO, 1966, 150 pp. (Environmental Health Criteria No. 178) Accession No: 960324 Reference Shelves REF 632.951:628.5 R

Morpholine

Geneva, WHO, 1996, 163 pp. (Environmental Health Criteria No. 179) Accession No: 960325 Reference Shelves REF 66.062:628.5 R

NSCA Pollution Handbook 1996: the Essential Guide to UK and European Pollution Control Legislation

Brighton, NSCA, 1996, 509 pp. Accession No: 960247 Reference Shelves REF 614.7 R

Proceedings of Workshop on Treatment Optimisation for Cryptosporidium Removal from Water Supplies

London, HMSO, 1995, 57 pp. Accession No: 960230, West Gallery 644.61

Sax's Dangerous Properties of Industrial Materials: Vols 1-III, 9th Edition

Lewis, R.J. (ed.), New York, Van Nostrand Reinhold, 1995, Accession Nos: 960254, 960255, 960256, Reference Shelves REF 614.8 R

Tetrabromobisphenol and Derivatives

Geneva, WHO, 1996 139 pp. (Environmental Health Criteria No. 172) Accession No: 960321 Reference Shelves REF 614.841.411:628.5 R

Tris(2,3-dibromopropyl) Phosphate and Bis(2,3-dibromopropyl) Phosphate

Geneva, WHO, 1995, 129 pp. (Environmental Health Criteria No. 173) Accession No: 960322 Reference Shelves REF 614.841.411:628.5 R

Water Byelaws (Loch an Sgoltaire) Extension Order 1995

London, HMSO, 1995, 1 p. Accession No: 960229 A 100 SI 1995/3155(S.230)

Water Quality - Guidance for the Preparation and Treatment of Poorly Water-Soluble Organic Compounds for the Subsequent Evaluation of their Biodegradability in an Aqueous Medium

London, BSI, 1996, 11 pp. (BS 6068:section 5.18:1996) Accession No: 960043 West Gallery 626.881

Air Pollution in the United Kingdom

(Sponsored by the RSC Environmental Chemistry Group and RSC North-West Analytical Division).

This one-day symposium will be held on Monday 23rd September 1996 at the University of Lancaster.

The programme for this meeting includes the following speakers:

Dr Martin Williams (Dept. of the Environment)	*UK and EU legislation on air pollution*
Dr Dick Derwent (Meteorological Office)	*Global air pollution problems*
Professor Roy Harrison (Birmingham University)	*Urban air pollution in the UK*
Dr John Ayres (Birmingham Heartland Hospital)	*Health effects of air pollution in the UK*
Professor David Fowler (Institute of Terrestrial Ecology)	*Rural air pollution in the UK*
Dr D. Crump (Building Research Establishment)	*Indoor air pollution*
Dr Steve Read (Enviro Tecnology services plc)	*New measurement techniques in air pollution*
Mr David Purchon (Sheffield City Council)	*The changing role of the environmental health officer*

For further details of this meeting, please contact the organisers:

Professor C.N. Hewitt, Institute of Environmental & Biological Sciences, University of Lancaster. Tel.(direct) 01524-593931, Fax 01524-593985; or

Dr Gerry Davison, Marketing & Commercial Liaison, University House, University of Lancaster. Tel. 01524-65201 ext. 4524/4084, Fax 01524-594069