

## Editorial

This is my first Newsletter as the new Editor. I thank Derek Rose, the former Editor for his contribution over the last few years. The newsletter has become a central resource for the EPG, and the material it includes does much to reflect the activity and interests of the group. The newsletter seeks to keep members informed about the numerous activities of the Environmental Physics Group, with occasional book reviews and other articles. Submission of articles of any type is welcomed; they should be sent to me electronically. The Group's Web site, currently run by Lucy Parkin, and the newsletter are planned to complement each other, with the web site providing late updates and meeting information.

This edition should be published soon after the annular solar eclipse in Northern Scotland on the 31<sup>st</sup> May. Anyone who came to, or heard about Prof James Milford's lecture at the IOP last year, will appreciate that eclipses are of great interest to environmental physicists as well as astronomers. This talk may have been difficult to get to from the North of the country, but EPG members in or near the annular eclipse zone now have the chance to remind those of us based in London and the South East what we may have missed. As no more solar eclipses will affect the UK for around 90 years, any articles or personal experiences of the eclipse are particularly encouraged for the next issue.

Karen Aplin

**Environmental Physics Group  
Annual General Meeting  
28<sup>th</sup> May 2003**

**Chairman's Report**

Our Tenth Anniversary celebration three years ago showed the diversity of the work done by members of the Environmental Physics Group, indicating perhaps it to be more suitable for a Division of the Institute rather than a Group. The celebration showed environmental physicists to be involved in facets of many fields of study and scientific disciplines, and raised again the question as to the definition of environmental physics. It also brought into question the role and objectives of the Environmental Physics Group, since the fields of study in which our members are involved are the concern of other established professional bodies and so do not need another body to promote them. Egbert Boeker and Rienk van Grondelle state in the Introduction to their book *Environmental Physics* that in the broad sense environmental physics can be considered “as the physics concerning the identification and measurement of environmental problems; it is devoted to the prevention of problems and the alleviation of existing problems”. If we accept Boeker's and van Grondelle's definition, the objectives of the Environmental Physics Group become clearer with its emphasis on environmental problems.

The meetings of the Environmental Physics Group this year have thus reflected the wide range of interests of its members and their involvement with inter-disciplinary environmental problems. Generally our lectures and conferences have been organised with other interested parties, and attendances have been satisfactory. The two evening lectures at the Institute of Physics, the first by Stephen Sparks after our AGM in May on the Dynamics of Volcanoes and the second in December by Mike Lockwood on the Solar Terrestrial Environment, were both joint meetings with the London and South East Branch. A full day conference on the Transport of Aerosols in June was co-sponsored with the Aerosol Society and the British Aerobiology Federation. A successful half-day meeting in November on the Built Environment that attracted many non-members was the one meeting organised solely by the Group. A one-day symposium on Waste Management, organised by the Environmental Physics Group and the Combustion Physics Group and supported by the Energy Management Group, took place at the Physics Congress in Edinburgh in March. The Environmental Physics Group was also involved in March with the Medical Physics Group and the Dielectrics Group in the organisation of a two-day meeting on RF Interactions with Humans, and in the 4<sup>th</sup> International Conference on Urban Air Quality held in Prague.

The Education sub-committee under the chairmanship of Peter Hughes continues in its efforts to interest school children in physics through an awareness of the physics involved in the natural environment around them.

I now retire from the Chair, having served for six years, and I wish to thank the members of the Committee for their help in running the Group. My particular thanks go to Derek Rose who has produced the Newsletter over the last few years and is now being replaced by Karen Aplin as editor, and to Lucy Parkin as our Web editor.

Lastly, I have to thank Peter Hodgson and Alexandra Wilson for their devoted work as Secretary of the Group while I have been its Chairman. The smooth running of a Group depends very much on its Secretary, and we have been very fortunate in having Peter and Alex. My especial thanks therefore on behalf of all Members go to Peter and Alex for their hard work and devotion.

I give my very best wishes to the new Chair that takes over from me and to the Environmental Physics Group for the continuation of its work.

E.G. Youngs

## **Honorary Secretary and Treasurer's Report**

### **Membership**

The current group membership stands at 504, which is comparable to last year's membership of 501. Correspondence and notification of meetings is increasingly being carried out via email and over three quarters of the members have email addresses. Therefore it is very important that the Institute is notified of changes in addresses.

The EPG awarded no travel bursaries in 2002. However at the beginning of 2003, we have awarded three travel bursaries to aid members of the EPG to attend conferences, talks and meetings. Two of these have been awarded to members to attend the international conference in Air Quality in Prague and the related costs are shown below in the finances.

### **Finance**

Expenditure over the last year and a half has largely been made up of room hire and catering for technical meetings. These meetings have included The Transport of Bio-aerosols, The Physics of the Built Environment, The Solar Terrestrial Environment and Environmental Physics in Totality. The Committee views these activities as one of the most important of the Environmental Physics Group as they promote the subject to physicists as well as to the scientific community more generally. There is an interesting mix of meetings planned for the future.

Currently the Institute annually allocates £1,500 to each Subject Group plus £6 per member of the Group. Groups are permitted to carry over any surplus funds to the following year. However from next year, the Institute will cap any Groups' allocation to limit their total funds to no more than three times their annual grant. This is not an immediate problem for the EPG as our peak total funds are typically only twice our allocation. However this rule must be borne in mind when considering expenditure each year.

### **Thanks**

I would like to make a special tribute to the retiring chair Edward Youngs for his invaluable contribution and his tireless efforts for the last 6 years as Chair of the EPG.

Alexandra Wilson

<b>Finance January 2002 – December 2002</b>		
2001 Balance b/fwd	£4,424.78	
2002 Budget award	£4,740.00	
Therefore Opening Balance for 2002	<b>£9,164.78</b>	
	Printing & Postage	-£1,359.16
	Committee Expenses	-£ 919.46
	Room Hire & Catering	-£2,674.52
	Speaker Expenses	-£ 129.40
Total Expenditure Costs	- <b>£5,082.54</b>	
Therefore Ending Balance	<b>£4,082.24</b>	

<b>Finance January 2003 - March 2003</b>		
2002 Balance b/fwd	£4,082.24	
2003 Budget award	£4,554.00	
Therefore Opening Balance for 2003	<b>£8,636.24</b>	
	Printing & Postage	-£626.26
	Committee Expenses	-£295.85
	Room Hire & Catering	-£ 75.70
	Travel bursaries	-£320.00
Current Total of Expenditure	- <b>£1,317.81</b>	
Therefore Balance at 31st March 2003	<b>£7,318.43</b>	

Alexandra Wilson

## Environmental Physics News

- **New Satellite Lightning Data available**

The NASA Global Hydrology Research Center would like to announce that it has received a new version of the Lightning Imaging Sensor LIS/Optical Transient Detector OTD Lightning climatology datasets for distribution. Those datasets are:

LIS/OTD 0.5 Degree High Resolution Full Climatology [HRFC] dataset size ~ 14.4MB

LIS/OTD 0.5 Degree Low Resolution Annual Climatology [LRAC] dataset size ~ 140.3 MB

LIS/OTD 2.5 Degree Low Resolution Diurnal Climatology [LRDC] dataset size ~ 13.0 MB

LIS/OTD 2.5 Degree Low Resolution Full Climatology [LRFC] dataset size ~ 4.4 MB

This new version, v1.0, supercedes the old version, v0.1. The new v1.0 gridded climatology products now include LIS data from 2001 and 2002, repair a minor calibration error applied to 1995 input data. The product algorithms have also undergone peer review.

In addition, we would like to take this opportunity to announce that two new time series datasets (LIS/OTD 2.5 Degree Low Resolution Time Series, and LIS/OTD 2.5 Degree Low Resolution Annual Climatology Time Series) will shortly be available.

Should you wish to order any or all of these datasets, please let the Global Hydrology Center know and they can be put on an anonymous FTP server for you to retrieve. And, if you have any questions about these items, please feel free to send an email to [ghrc@eos.nasa.gov](mailto:ghrc@eos.nasa.gov).

- **Please submit news items for the next edition to Karen Aplin**

## Forthcoming Events

### **Foresight Flood and Coastal Defence Project** **An assessment of UK flood risk 2030 to 2100 - the challenges and choices**

Monday 7th July 2003 , The Institution of Civil Engineers, 1 Great George Street,  
London SW1P 3AA

This event will present the latest research to determine future flood risk and coastal erosion for the UK between 2030 and 2100. This work compares and contrasts the effects of a wide range of factors – such as climate change, socio-economic trends, land use, urbanisation and regulation, and will present economic, social and environmental impacts for different future scenarios. The event will also provide a forum to debate plans for the next phase of the project – which will consider how the UK might respond to the future challenges of flooding and coastal erosion. Attending will enable your views to be fed into this important Government project.

The UK Government's *Foresight* programme, managed by the Office of Science and Technology, aims to provide challenging visions of the future, to ensure effective strategies now. It does this by providing a core of skills in science-based futures projects and unequalled access to leaders in government, business and science.

The aim of the *Foresight Flood and Coastal Defence Project* is to produce a challenging vision for the future of flood and coastal defence over the next 30 to 100 years that takes account of the many uncertainties, but is robust, and can be used as a basis to inform policy and its delivery. The Project covers all of the UK, and considers a wide range of types of flooding (fluvial, coastal, estuarial and urban) as well as coastal erosion. Over the last six months a team of leading experts has explored the mechanisms and impacts of future flooding and coastal erosion for different future scenarios. This conference will present those possible futures and in so doing will identify how future risks of flooding and coastal erosion could change across the UK. It will also compare and contrast a wide range of factors that will affect future flooding and coastal erosion. The results of this work, and the views of the attendees of this conference will be used to inform the next phase of the project - which will consider how the UK might respond to the challenges ahead.

*This event is aimed at a wide spectrum of professionals who are concerned with flooding and coastal erosion and its interaction with the environment, society and the economy. It will be of interest to policy makers in central and local government, environmentalists, sociologists, economists, planners, scientists and engineers as well as flooding professionals.*

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**PRASEG 2003 Conference:  
A Sustainable Energy Future -  
Action on Aspirations !**

Tuesday 8th July 2003: 9.00am to 5.00pm, One Great George Street, Westminster,  
London SW1

The PRASEG 2003 Conference and Exhibition comes at a key time in the development of energy policy. With the publication of the Energy White Paper there is still much to be done if the Government's aspirations, expressed in the White Paper, are to be delivered.

In addition to the Conference, the exhibition floor will be open throughout the day representing all aspects of the sustainable energy industry. Following the Conference, we will be holding a drinks reception to allow attendees, speakers and guests to network with colleagues from across the sector.

If you would like to attend the conference please confirm your attendance, in writing, with the PRASEG office as soon as possible. Space is still available at the Exhibition, please call the PRASEG office for further details.

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## **Electrified aerosols in the environment**

Wednesday 9<sup>th</sup> July 2003, Institute of Physics, London

This one-day meeting will focus on the abundance and effects of charged aerosols in the natural environment. Thunderstorms are commonly believed to be the principal source of electrified particles on Earth, but charged aerosols and weakly electrified clouds exist in many natural and artificial situations. The general topic of charged aerosols has relevance to many areas of science, including atmospheric and health physics, process engineering and air pollution. This meeting will explore the interdisciplinary areas in which charged aerosols are already known to be important. It is sponsored by the Environmental Physics Group and The Aerosol Society.

Speakers will include

**Charged aerosols, cloud and climate** (Dr K. Carslaw, *Institute for Atmospheric Science, University of Leeds*)

**Charged particles and health** (Dr J. Allen, *Department of Physics, University of Bristol*)

**Charging on the edges of clouds** (Dr C. F. Clement, *QuantiSci Ltd, Oxon*)

**Corona ions and power lines** (Prof D. L. Henshaw, *Department of Physics, University of Bristol*)

**Deposition of charged droplets** (Dr L. Gaunt, *Bioelectrostatics Research Centre, University of Southampton*)

**Long-term changes in aerosol and atmospheric electricity** (Dr G. Harrison, *Department of Meteorology, University of Reading*)

**Measurements of atmospheric ions** (Dr K. L. Aplin, *Rutherford Appleton Laboratory*)

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## **Optical Environmental Sensing**

Thursday, 9th October 2003, at Photonex03, Stoneleigh Park, Warwickshire, UK

The meeting is intended as a forum for presentation and discussion of current developments in Optical Environmental Sensing. The meeting will encompass a wide scope including new developments in optical measurement techniques and novel optical methods for monitoring the atmosphere and terrestrial environment. Remote optical sensing techniques are already widely used for quantifying atmospheric constituents from the ground, air and satellites. Satellite remote sensing is routinely used for weather prediction but also for crop forecasting, mineral exploration and collection of data relating to urban and rural environmental issues leading to more accurate models of the global climate. Additionally, in-situ environmental monitors utilising optical techniques such as fibre optic probes, UV, Visible and IR spectroscopy, and tunable diode lasers are being applied to monitor the environmental impact of transport, industrial processes, waste management and compliance with government regulations.

Suggested topics for oral presentation, to include but not necessarily limited to :-

- Novel optical sensors for gas, liquid or solid phase
- Design and testing of optical sensors
- QA/QC of optical techniques
- Radiative transfer and inversion methods
- Terrestrial optical remote sensing from ground, air and satellite
- Optical sensors for industrial process monitoring
- Optical sensors to control industrial processes
- Optical methods for environmental impact assessment

Full call and registration details can be found on the technical programme web pages of [www.photonex.org](http://www.photonex.org)

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## **Environmental Physics Conference**

6<sup>th</sup> –10<sup>th</sup> February 2004, Minya, Egypt

Organized by Egyptian Nuclear Physics Association (ENPA) Cairo, Egypt  
in cooperation with Faculty of Science, Minya University

Further information is available at

[http://www.geocities.com/Athens/Library/7348/EPC\\_04.html](http://www.geocities.com/Athens/Library/7348/EPC_04.html)

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## Recent Meetings

The Institute of Physics Congress was held from 23-27 March at Heriot-Watt University, Edinburgh. Several parallel meetings and conferences were held on diverse topics, from Optics in Biomedicine and Life Sciences to a meeting about safety in vacuum systems called, "Worried about Nothing". Two topics may be of particular interest to the Group, primarily the Waste Management meeting, which was co-sponsored by the EPG. The international Electrostatics 2003 conference, with over 100 poster and oral presentations, also included an Environmental Electrostatics session.

### **Waste Management Seminar 25 March 2003**

This event was a one-day meeting, organised jointly between the EPG and the Combustion Physics group. The morning session principally addressed waste management and waste treatment issues, and the afternoon session focussed on waste combustion and incineration. The event was reasonably well attended with an average of about 25 Congress delegates present.

Waste management is a multidisciplinary subject, and this was reflected in the background of the speakers, ranging from mechanical engineering to biotechnology to civil engineering. The topics discussed covered both short-term problems (landfill sites) and *very* long term issues (radioactive waste).

Prof. David Manning from the University of Newcastle started the meeting by describing how landfill sites could be used to study anaerobic processes that would be very hard to study otherwise, with access to the leachate providing the means of following the long-term stabilisation processes. He also suggested that the forthcoming ban (through the EU Landfill Directive) on organic waste disposal in landfill might affect the balance of these reactions in a way that may cause problems in the future.

Tom Misselbrook from the Institute of Grassland and Environmental Research (IGER) gave an informative talk on reducing the gaseous emissions from livestock manure. Some incredible figures were presented - over 90 million tonnes of manure are produced in the UK each year, with an equivalent fertiliser value of £200 million; agriculture is responsible for 70% of UK emissions of nitrous oxide and 40% of methane emissions. He then went on to describe the results of the work at IGER to determine the best farming practices to reduce ammonia production.

Dr. Simon Norris of NIREX summarised the proposed phased disposal concept for radioactive waste in the UK. The results of modelling extremely long-term (millions of years) leakage processes were discussed, along with the proposed deep burial (650 m) disposal scheme.

The final talk in the morning session was given by Dr Lesley Batty from the University of Newcastle, who described how compost substrate could be used in the passive remediation of polluted mine waters.

The afternoon session began with Prof. Fred Lockwood from Imperial College describing the pros and cons of the combustion of sewage sludge as an alternative to landfill disposal or land dumping. He discussed how the energy content of the sewage could be recovered, with particular emphasis on co-firing with other fuels. He went on to discuss the pollutants produced in the process, concentrating on the problems caused by small-scale particulate matter, "PM2.5s".

The "energy from waste" idea was also the theme of Prof. Jim Swithenbank's presentation (University of Sheffield), this time focussing on the combustion of municipal solid waste (MSW). He presented the results of modelling the combustion process through an incinerator, and described the design of a "ball" instrument that passed through the incinerator during operation, collecting data.

Prof. Paul Williams described how the products of tyre pyrolysis could be upgraded to give real value products that could make the whole process profitable. The UK alone produces more than 30 million scrap tyres a year, with nearly 30% still being dumped.

The final talk of the meeting was given by Phil Canning from Powergen, with an industrial perspective on the potential for extracting energy from waste through incineration. He explained how the Renewables Obligation forced generators to produce electricity from so-called renewable sources (including biomass), and described Powergen's experiments with co-firing coal and ~10% biomass material.

Andrew Rowley

### **Electrostatics 2003: Environmental Electrostatics 27 March 2003**

The Electrostatics and the Environment session started with an overview lecture by G Castle (University of Western Ontario, Canada), who discussed what he judged to be the most significant areas of environmental electrostatics. He gave a historical perspective on the evolution of the global electric circuit, mentioning the year 1752 as an important year when three scientists in different countries (Franklin in the USA, d'Alibard in France and Canton in the UK) made important conceptual advances in the understanding of thunder and lightning. More recent applications are often focused on the removal of pollutants by electrostatic techniques, which are aiming to remove gases such as nitrogen and sulphur oxides. The separation of plastics for recycling is another challenge for electrostatics, especially as one cap in 10,000 bottles of another type of plastic can contaminate the whole batch. New methods charge plastics triboelectrically (by rubbing), and the different plastics charge in different ways. Using a rotating drum to separate the charged plastics can give an 85% recovery rate.

The other speakers reported aspects of their research, with forthcoming refereed papers in *Institute of Physics Conference Series*. H Zastawny presented collaborative work between the Université de Poitiers, France and McMaster University, Canada in which a high voltage discharge could be used to treat water. Pulsing a high voltage through water has two beneficial effects, firstly it stimulates chemical reactions which can remove pollutants such as metal ions and pesticide residues. Secondly, a pressure

wave is set up in the water by the arc discharge, which can eliminate micro-organisms in water pipes.

Unfortunately the talk given by Prof Law of the University of Georgia, USA was very topical. It referred to the use of electrostatic spraying to decontaminate people in the event of a bioterrorist attack. This makes use of the preferential deposition of electrically charged sprays. Since the decontaminant sprays used were charged by 1kV dc, safety was an important constraint. The talk described the detailed modelling of the human body shape, and aspects such as the design of the decontamination chamber which has slightly charged walls to repel the spray back to the person it is intended for. In trials using a mannequin, 45 of 52 body sites showed a statistically significant deposition of fluorescent antibacterial charged spray than the uncharged spray.

Karen Aplin

## **Optics at Congress**

There was much to interest the optics community at this year's Physics Congress in Edinburgh, stemming perhaps from the excellence of the research and teaching in this field in the Scottish universities. Optical technologies and techniques have a huge range of applications and several of the papers were of relevance to environmental physics. A session on Novel Light Sources and Displays included presentations on the latest work in the rapidly developing field of polymer light sources. The anticipated applications include highly efficient LED sources for illumination in the built environment and as a new, mass-producible laser source for sensors utilising absorption or fluorescence spectroscopy.

In Structured Optical Materials, the focus was dominantly on the nano-scale design of crystalline structures, with applications including a new type of solar cell and colour change sensors in mind. A further session, devoted to Optics in Biomedicine and the Life Sciences, included a presentation on improvements in waveguide sensors for bacteria detection. Perhaps a future meeting on Optics in the Environment could also include topics such as atmospheric and underwater measurements, and particle characterisation.

Peter Hodgson

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