

## Editorial

Welcome to the autumn Environmental Physics Group Newsletter, containing the usual mixture of “what’s on” information, reports on recently held meetings and a book review. Group meetings are usually planned and arranged by members of the Committee, and the newsletter often reflects these activities. However, we are keen to make sure that both the activities and the newsletter reflect the wide interests of Group members. To do this we need your suggestions! We are planning a questionnaire on members’ interests, which will be circulated with the next Newsletter in spring 2004. However, ideas for meetings or topics you would like to see covered by the Group are welcomed at any time: please contact any member of the Committee with your comments.

Newsletter articles or suggestions for improvements are also invited and should be sent to me. Radio 4’s Document programme recently featured an environmental physicist testing for radioactive contamination at a suburban housing estate. Perhaps an “Environmental Physics in the News” page in the newsletter, covering interesting media stories would be of interest: if so, send me your contributions now...

Karen Aplin

### **STOP PRESS NEWS**

The Newsletter goes to press at a time of unprecedented solar activity. Although the Sun is between a maximum and minimum in its 11 year cycle, two giant sunspots have recently appeared which have produced several massive solar flares, and on 4<sup>th</sup> November, the largest solar flare ever.

Solar flares can cause communications problems on Earth and also increase the dose of radiation received by aircraft personnel. Fortunately the 4<sup>th</sup> November solar flare was not ejected directly at Earth and so we have not seen its full force. Some communications problems were reported at polar latitudes and high altitudes as a result of the earlier solar flares on 28<sup>th</sup> and 29<sup>th</sup> October. The Official Space Weather Advisory issued by NOAA Space Environment Center Boulder, Colorado, USA reports that the November 4<sup>th</sup> solar storm caused a complete blackout of shortwave communications on the sunlit side of Earth. It may also cause passengers and crew in commercial jets at high latitudes to receive low-level radiation exposure equivalent to approximately 1 chest X-ray. It was recommended that radiation doses for staff flying at high latitude were carefully monitored for the next few days. Astronauts also had to take shelter from the solar radiation in the most highly shielded part of their spacecraft.

# Forthcoming Events

## Short Courses on

### **Aerosol properties and measurement**

### **Atmospheric particles: Properties and measurement**

18th - 19th Nov 2003 and 20th Nov 2003

The Division of Environmental Health & Risk Management, The University of  
Birmingham, Edgbaston, Birmingham, B15 2TT.

#### **Aims and scope of the courses**

##### *Aerosol properties and measurement*

The course covers the fundamental properties and behaviour of aerosols, and their size and composition measurement, including live demonstrations of state of the art aerosol characterising instrumentation.

The aim is to provide theoretical and practical training to those professionals involved in the many industrial, environmental and research situations where particulate matter is encountered.

##### *Atmospheric particles: properties and measurement*

This course will apply the fundamental principles of aerosol science to the study of atmospheric particles, including their origins, composition, measurement and effects and includes live demonstrations of instrumentation used in monitoring. The aim is to provide training for professionals involved in air quality research, management, control, legislation and health impacts.

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## **Freak Ocean Waves**

**Dr Peter Janssen**

**(European Centre for Medium-Range Weather Forecasts, Reading)**

**A joint Environmental Physics Group/London and SE Branch lecture**

6pm at the Institute of Physics, 76 Portland Place, London

28<sup>th</sup> January 2004

*Peter Janssen writes:* The question I asked myself some time ago is whether the classical picture, that resonant four-wave interactions play an important role in the evolution of surface gravity waves, still holds for strongly nonlinear waves, such as freak ocean waves. It turns out that only a slight extension of the classical approach is needed. This extension allows a description of freak ocean waves as is illustrated by means of the numerical simulation of nonlinear surface gravity waves. It is now also in principle possible to predict the conditions under which freak waves are most likely occur.

## **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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## FIRST ANNOUNCEMENT

### **Environmental Physics Group Members' Open Day**

at the Institute of Physics, 76 Portland Place, London

Wednesday 19<sup>th</sup> May 2004

Members may remember the Open Day held a few years ago to celebrate the 10<sup>th</sup> anniversary of the founding of the Environmental Physics Group. The meeting proved to be an excellent opportunity for the community to get together and discuss the diversity of environmental physics. The EPG committee feel that the meeting should run on a regular basis and that the time is right to hold the second Members' Open Day meeting.

The meeting will comprise a series of talks, poster presentations and exhibitions on members' interests in environmental physics over the course of the day. There will also be several opportunities to talk informally to colleagues, including over a buffet lunch. There will be no charge to members attending the meeting. A limited number of places may be available to non-members (a fee will be charged). A number of EPG travel bursaries will be available to assist members in getting to the meeting.

All members are invited to offer oral and poster presentations to the meeting. Other offers of contributions (*e.g.* photographic display, table-top demonstration) related to members' interests in environmental physics are also welcome. In the first instance please indicate your level of interest by returning the form below to me before 31<sup>st</sup> December 2003. Would members wishing to contribute material to the meeting please submit an abstract or details of the contribution to me by 28<sup>th</sup> February 2004.

Please return the form to: Dr. Peter Hodgson, Sci-Fact, PO Box 3334, Sheffield, S11 7WP

Alternatively, email me at [EPGmembersday@sci-fact.com](mailto:EPGmembersday@sci-fact.com)

I look forward to seeing you at the meeting.

Peter Hodgson

Vice-Chair

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Environmental Physics Group Member's Open Day at the Institute of Physics, 76  
Portland Place, London, Wednesday 19<sup>th</sup> May 2004

Name: -----

Address: -----

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Telephone: -----

Email: -----

- I am interested in contributing an oral presentation to the meeting
- I am interested in contributing a poster presentation to the meeting
- I am interested in contributing in some other way (please indicate your idea)
- I am interested in attending the meeting



## Einstein 2005

In 1905 Einstein published three ground-breaking papers in *Annalen der Physik* on special relativity, the photoelectric effect and Brownian motion. To celebrate the centenary of Einstein's *annus mirabilis* and to take stock of subsequent progress in physics, the Institute is organizing a major conference at Warwick University on 10-14 April 2005. The meeting aims to identify new and emerging themes in physics, particularly in interdisciplinary areas. It will be chaired by Sir Michael Berry of Bristol University and be aimed squarely at professional physicists.

The conference will consist of an invited programme of speakers and contributed posters, with the organizing committee covering a range of research interests. Each day will feature a number of parallel symposia and plenary talks given by international speakers. In all sessions the emphasis will be on scientific quality. Depending on the response to the conference, it could serve as a prototype for a similar meeting to be held every two years. For more information and to receive updates on the meeting, see [physics2005.iop.org](http://physics2005.iop.org) or contact the secretary to the conference ([leah.zeto@iop.org](mailto:leah.zeto@iop.org)).

### Einstein and the Environment

The Institute is also encouraging Groups to organise meetings to celebrate Einstein year, and the EPG is assessing the feasibility of a meeting devoted to the application of Einstein's work to the environment. The operation of  $E = mc^2$  in the sun ensures that we have a habitable environment on earth, and our control of fission (at present) and fusion (in the future) processes can provide as much electricity as we require with minimal output of greenhouse gases. Photovoltaic cells utilising solar radiation are an increasingly viable source of renewable energy. But perhaps the most important and relevant topic for the EPG is Einstein's treatment of Brownian motion, because this theory has led to the development of the theory of dispersion, now applied extensively to the study of dispersive processes in fluids, whether in the atmosphere, the seas, or in soil and ground water.

If members have ideas for topics that could be included in a commemorative meeting by the EPG, please let me know before the end of the year. Offers of papers, with titles and authors, would be welcome. The EPG Committee will meet in January, when we will consider if we have sufficient support to propose such a meeting to IoP. This is important, because the IoP wishes to vet all such proposals to ensure that they are of sufficient quality to celebrate Einstein year.

Derek Rose

## Recent Meetings

### **4<sup>th</sup> International Conference on Urban Air Quality Measurement, Modelling and Management, 25-27 March 2003, Charles University, Prague, Czech Republic**

Hello and greetings from Thailand. May I introduce myself? My name is Arpa Wangkiat, and I am now doing a Ph.D. in Environmental Technology at the Joint Graduate School of Energy and Environment (JGSEE), Thailand. After I finish my degree I will resume my position in Department of Environmental Engineering, Collage of Engineering, Rangsit University, Thailand. I have been conducting my PhD dissertation in source apportionment of aerosols in northern Thailand. The main aims of the project are to characterise the chemical compositions of PM<sub>10</sub> and conduct the apportionment of possible emission sources in northern Thailand.

At the start of 2002 an English friend sent me an announcement of 4<sup>th</sup> International Conference on Urban Air Quality Measurement, Modelling and Management, 25-27 March 2003, Charles University, Prague, Czech Republic. As a Ph.D. student I have to present at least 1 paper in an international conference, I certainly submitted an abstract. After the conference committee had accepted my abstract, I applied for a bursary from the IOP Environmental Physics Group. I was also partially supported by my university. Finally, I really had a very good chance to attend and present my paper at the conference.

About 200 participants attended the conference and most were from Europe. A total of 130 papers were presented, their subjects being distributed across 7 topical areas. The conference opening ceremony at Magna Aula, Charles University in Czech style was magical. Also a conference reception at Faculty of Sciences with traditional musical was very impressive. The municipal hall with participants had a conference dinner was very beautiful. All the programs were excellently organised.

During the conference it was a very productive and beneficial experience for me with specialized lectures organised from place to place and from topic to topic. I could learn more from many outstanding researches throughout Europe on air pollution modelling, sources and emissions, air quality management, aerosols, personal exposure and impacts, urban meteorology and local studies. It gave me many ideas that were very useful for my future research.

In the end, I would like to put on record of my deep appreciation to all those who were involved in the conference. I also wish to express my gratitude to IOP for supporting my registration fee. I certainly hope that the conference can be repeated with even greater vigor in two years' time.

Arpa Wangkiat

## Electrified aerosols in the Environment

9 July 2003

A one-day meeting was held at the Institute of Physics on 9<sup>th</sup> July 2003. It included a range of presentations covering aspects of charged aerosol behaviour in the environment. Charged aerosols and weakly electrified clouds exist in many natural and artificial situations and the meeting specifically sought to identify interdisciplinary aspects of electrified aerosols in Environmental Physics. There were 34 attendees, including two from outside the UK. Dr **Jan Marijnissen** (*University of Delft*) provided an introductory overview, including a discussion of the generation of natural electrosprays from plants and trees. This can occur during thunderstorms and provides a method of artificially extracting material from trees. Another natural source of highly-charged environmental aerosols is a volcanic eruption. Dr **Mike James** (*Lancaster University*) described measurements of charged aerosol plumes from volcanoes, in which charge densities of  $\mu\text{C.m}^{-3}$  to  $\text{nC.m}^{-3}$  are common. Surface electric field measurements provide a method of detecting volcanic plumes. The Mt St Helens plume remained charged at 200km from the eruption.

Dr **Ken Carslaw** (*University of Leeds*) presented material on the links between natural ionisation, from cosmic rays, could influence clouds and climate. Many aspects of the mechanisms are highly physically plausible, but the topic is controversial in atmospheric science. Dr **Charles Clement** (*Enviros-QuantiSci*) described theory for the aerosol charging on the edges of clouds, for which he also provided experimental support. The reduced air conductivity in clouds causes fields larger than those in free air values to exist. Dr **Giles Harrison** (*The University of Reading*) showed how atmospheric electrical measurements obtained over long periods could give insight both into global atmospheric electrical changes, and local effects of air pollution, such as in Victorian London. Beginning the afternoon session, Dr **Karen Aplin** (*Rutherford Appleton Laboratory*) outlined the range of atmospheric ion measurements. A new method has been developed to extract ion mobility spectra from past measurements of air conductivity near clouds, which will increase the limited amount of experimental data available.

Dr **Janet Allen** (*University of Bristol*) described some effects of charging on human health. Many materials used in hospitals are not chosen for their electrostatic properties. In some cases, such as the use of disposable plastic aprons, electrostatics can become very important in the transfer and surface retention of micro-organisms. Prof **Denis Henshaw** (*University of Bristol*) discussed the charging of ultrafine aerosols downwind of power transmission lines. The charging leads to an increase in aerosol deposition in the lung and the aerosol deposited may contain carcinogenic hydrocarbons. Dr **Lindsey Gaunt** (*University of Southampton*) showed how charged liquid sprays could be generated using passive charging technology, by promoting shear in the droplet formation. Charged liquid sprays are effective in removing domestic dust and allergen-containing particles.

The meeting was sponsored by The Aerosol Society and the Institute of Physics Environmental Physics Group, and organised by Giles Harrison and Denis Henshaw.

Giles Harrison

## Book Review

### *Environmental Physics* by Claire Smith

The study of the environment requires a holistic approach involving many disciplines and physics is just one of these. It is fundamental for understanding environmental processes as a whole and forms an important plank in the building of environmental science along side the many other subjects. Clare Smith's aim in writing *Environmental Physics* was to make the understanding of the physics underpinning environmental science accessible to the wide multi-disciplinary audience that is involved, even to those with little prior knowledge of physics. To this end, the mathematical treatment is kept to a minimum without the use of calculus, although algebraic equations are included since these provide the most appropriate language to describe many phenomena, so that a basic mathematical background is required.

After the Introduction that sets out the importance of physics in the study of environmental science as a whole, there are seven chapters. The first chapter introduces Newtonian mechanics and deals with the study of forces, momentum and motion. The second chapter describes energy in all its forms, and this is followed by a chapter on heat and radiation. The fourth chapter gives an account of the physical characteristics of matter that determine the processes occurring in the environment. The last three chapters describe the Earth's climate and climate change, sound and noise in the environment, and finally radioactivity and nuclear physics that arise in many activities and are not just concerned with nuclear power stations. Each chapter ends with a summary of its main contents, some numerical questions with answers for the student, and a list of pertinent books for further reading. The book has two appendices. The first outlines some of the basic mathematical procedures to help those with limited mathematical background to perform simple calculations and to act as a reminder of basic algebra to others, although students who need this outline probably would not appreciate the use of algebraic equations to describe physical processes. The second provides a list of symbols and abbreviations. Then follows a useful Glossary, and the book ends with a good index. Boxes are used to contain interesting accounts of environmental topics that are relevant to the main text. These highlight how physics is applied to practical events in everyday life and the environment. The text throughout is accompanied by clear illustrations.

An excellent feature of this book is the way Clare Smith describes the physics in everyday observations, thus showing how environmental physics provides a good introduction to basic physics. Unfortunately, however, the book contains a few errors that are a matter of concern, especially in a physics book intended for the non-physicist. The discussion on circular motion describes the centripetal force as acting away from the centre of rotation with a centrifugal force acting towards it! Also, anyone concerned with diffusion will be surprised to be told that the concentration profile of diffusing substance during the linear diffusion from a constant source gives an exponential relationship instead of being described by the error function.

The coverage of the broad field of environmental physics is fairly comprehensive, although a few important phenomena are omitted or given too scant attention. The present edition provides little insight into the physics associated with the unsaturated soil between the Earth's surface and the water table, yet this buffer region holds vast

amounts of water and is the environment that sustains life and is subject to much pollution from agriculture and industry. This omission should be remedied in any revision. Associated with this should be an introduction to the soil-plant-atmosphere continuum. A revised edition could also include more on atmospheric optics to include the increasingly important subject of light pollution and also the physics of lunar and solar haloes that fascinate many people.

*Environmental Physics* generally fulfils the aim of the author in providing a text to “cover a broad remit at a level that makes the subject accessible to a wide audience, including many with little prior knowledge of physics”. Moreover, it does this while making physics interesting and its style lends to a good introduction both to environmental physics and to physics generally. It is a pity that errors were not corrected before publication. Hopefully, any new edition will rectify matters.

Edward Youngs

**Full details of book reviewed:** Smith, Claire. *Environmental Physics*. Routledge London, 2001, xiv + 304 pp., £80, ISBN 0-415-20190-X (hbk) £70.00, ISBN 0-415-111-20191-8 (pbk) £17.99

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