IOP Institute of Physics
Environmental Physics Group

NEWSLETTER April 2011

Environmental Physics Events in Scotland

Edinburgh City Chambers was the impressive location for two recent events

Contents

Welcome note **3**

EPG News **4**
A message from Pat Goodman, the chair of the EPG *4*
Old copies of the newsletter *5*
Environmental Physics Group Survey. *5*

Reports from previous EPG events **8**
Clouds and the Earth's Radiation Balance and an evening lecture by Prof Paul Hardaker *8*
Implementing a Carbon Capture & Storage Cluster in the Next 5 Years. *9*
13th International Conference on Electrostatics *10*
Aerosols and the environment *13*

Forthcoming Environmental Physics Group Events **15**
Environmental Physics Day *15*
Geoengineering the Climate: An Overview and Update *17*
The greenhouse effect and global warming: celebrating the work of John Tyndall *18*

Forthcoming IOP Events **19**
PetroPhase 2011: 12th International Conference on Petroleum Phase Behavior and Fouling *19*
Sensors and their Applications XVI *19*

Other Forthcoming Events **20**
The Mathematics of the Climate System *20*

Other Activities **21**
Volunteers wanted for Physics in the Field *21*
Research Student Conference Fund *22*
CEDA Repository *22*
Getting chartered workshops *23*
IOP for Africa: An update on the campaign for physics education *23*
Environment Engineering: The Fiona and Nicholas Hawley Award *24*
Environmental physics word search *25*

EPG Committee **26**

Hello and welcome to the April 2011 newsletter!

We hope you all have had an enjoyable Easter.

This latest newsletter reports the results of the winter's EPG survey into members' interests (page 5). The results provide a useful insight into the wide range of activities and talents of the group. It also shows gaps where members would like events organised (subject area and geographically), where presently there are none. So if you have an idea for an event, would be willing to speak, or would like to host an event, then please contact us.

With changes to the IOP rules into the length of service of committee members (see page 4), we welcome new members to the committee – please contact Pat or Paul (details on page 26) if you are interested, come along to our annual Environmental Physics Day on Wednesday 25th May to find out more (pages 15-16).

We hope you enjoy this latest newsletter.

Sally Brown and Hugh Mortimer

EPG News

Message from Pat Goodman, the chair of the EPG.

Dear Colleagues,

It's that time of year again when our Environmental Physics Day including AGM is rapidly approaching. We have had a very busy year, with many successful events, details of which you will find in the newsletter. Our members' day which takes place on the 25th May has now become firmly ensconced as an important event in our calendar. It provides our members with an opportunity to meet one another, while at the same time providing a scientific platform for members to inform us about the diverse range of activities that they undertake in their jobs and research.

The AGM will also be held on the same day. The IOP have now changed the regulations, as groups do not need to hold a physical AGM. However in the Environmental Physics Group, we believe that it is an important forum for members to question the committee and to get involved in the activities of the group.

Additionally, a consequence of the new regulations means that committee members must step down after 9 years of service. Subsequently we will be loosing Peter Hodgson, Karen Aplin and Ian Colbeck. Curtis Wood and Alison Buckley have also decided to step down. On behalf of all of the members, I would like to thank all of them for the immense contributions they have made to the EPG over many years. As Chairman of EPG I do not believe that this is a good rule of the IOP as these people have significant contributions to make to EPG (and other groups). However I do believe there should be a restriction on the length of service of officers on committees, as new people bring fresh and novel ideas. I have written to the IOP on this matter, and I believe that other groups have done likewise. We will keep you informed of developments.

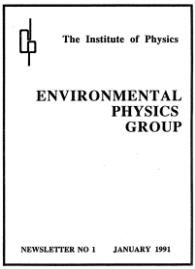
With the loss of such experience from our committee it clearly leaves places for new members. I would actively encourage you to consider becoming part of the EPG committee. Please feel free to contact me, or our Hon Secretary Paul Williams for an informal chat (our contact details are listed on page 26). Once again I'd like to express my thanks to all the committee for their hard work over the past year, and to Sally and Hugh for their work on the newsletters.

Sincerely

Pat

EPG News

Old copies of the newsletter

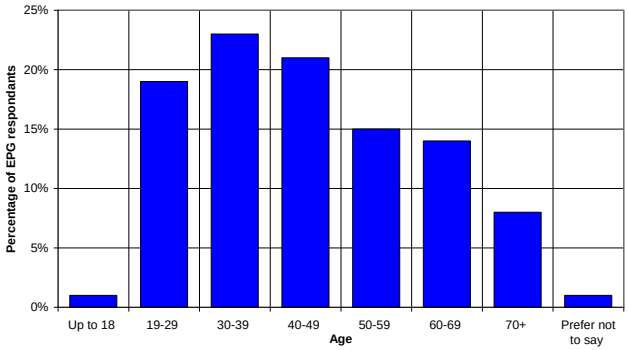


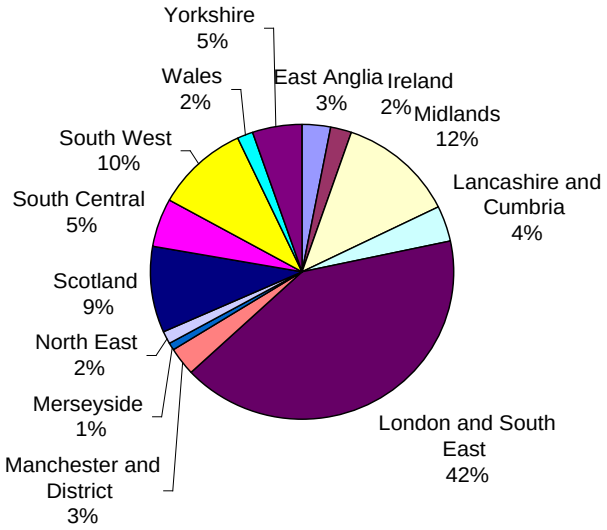
Last year Prof Edward Youngs kindly donated his old EPG newsletters. These are now online and can be downloaded from http://cedadocs.badc.rl.ac.uk/ Click '*Browse by type*', followed by '*Other'*. There are 43 out of the 44 editions of newsletter available, with only number 2 (in 1991) missing. Thanks to Edward for donating the newsletters and the CEDA Repository for hosting the archive (for more info about the CEDA Repository, see page 22).

Environmental Physics Group Survey

A big thank you to the 131 members who completed the EPG online survey of members' interests. It was a great response and revealed some very interesting statistics about the EPG. A summary of the results is below, and a presentation will be given on these during Environmental Physics Day on Wednesday 25th May (see pages 15-16).

58% of respondents were 'members' of the IOP, and 9% held 'student membership'. 76% of respondents were male. The results indicated that we have a wide age range of group members, with most people being in the 30-39 year old age group, as shown in the figure below.

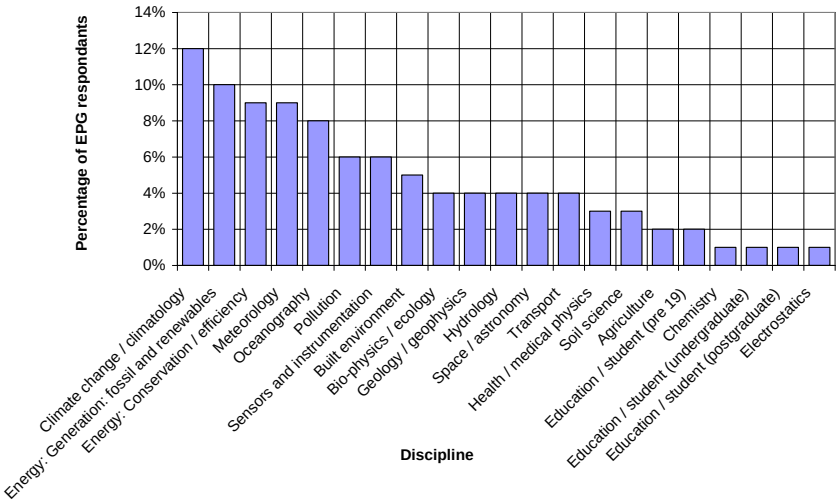




We also asked you which regional branches you were a member of, or at which branches you attended events – as several members commented, this wasn't necessarily where you lived, as you were prepared to travel further afield. For instance, several people in the Scottish Branch, were also interested in events in the London and South East Branch. Subsequently 42% of respondents were interested in events in and near the Capital.

Another question asked about your discipline. This question received a wide spread of results and certainly showed the wide range of members' interests. The highest percentage of people's work is in the climate change/climatology field (13%), followed by meteorology (9%), energy generation (9%) and energy conservation/efficacy (9%). 35% of all respondents work in research, 22% in consultancy and 18% in education.

To help plan and organise future events, we wanted to see what subjects you were interested in hearing more about. Again, this question showed the wide range of members' interests and enthusiasm for a range of subjects. This is shown in the figure below.



As the majority of members' disciplines fell into the themes of climate, meteorology and energy generation and conservation, these topics were not surprisingly the most popular subjects that members would like to see more events on. Pollution, oceanography, sensors and instrumentation were also popular topics. The results have also been broken down into regional branches. This indicated that the Midlands branch was interested in medical physics, pollution and energy generation; the London and South East branch contained many of the people who were interested in energy generation, conservation and efficiency; and the Scottish and North-East branches were most interested in climate change / climatology, meteorology, sensors and instrumentation, oceanography, pollution.

Finally, we asked if you had any other comments. We had a range from:

- "keep up the good work"
- "keen to hear about a wide range of environmental issues and how members are contributing to that agenda"
- "pleased to receive the excellent newsletter",
- "more meetings in Scotland"
- "please could more meetings be held in the West Midlands"
- "more meetings with a holistic overview of several different areas together and how they interact"
- "more meetings with broad appeal, relating to grand challenges, e.g. climate, energy, and perhaps jointly with other societies".

- *Many of the disciplines or branches where members have requested more events are 'gaps' where present committee members do not cover, either in terms of discipline, or geographical location.*

- *If you are in one of these disciplines, branches or are a member of another society, and would like to organise a joint event, then please contact the Group Chair or Secretary - details are on the back of the newsletter. We also welcome potential speakers to volunteer to give talks.*

- *With changes to how long members are allowed to remain on the committee we are looking at reduced committee member numbers, particularly those with experience of working on the committee (see page 4). If you would like to organise any event, and attend committee meetings, even just for the duration of the time you organise that event, then please contact Pat Goodman (contact details at the back of the newsletter).*

Reports from EPG Previous Events

Clouds and the Earth's Radiation Balance – Observational Evidence and evening lecture by Prof Paul Hardaker

Edinburgh City Chambers, Edinburgh
Wednesday 16th March 2011

On 16th March 2011, the Royal Meteorological Society and EPG jointly hosted a meeting entitled 'Clouds and the Earth's radiation balance - observational evidence.'; organised by Curtis Wood and Richard Allan. The Speakers were Richard Allan, John Harries, Jon Shonk, Jim Haywood. A second event in the evening was a talk given by RMetS Chief Exec Paul Hardaker.

Richard Allan introduced the session and outlined the importance of the observational record for understanding radiative processes and changes. Following this John Harries discussed the importance of satellite-based measurements of the radiation budget, including the importance of spectrally resolved measurements. Jon Shonk presented an illustration of the impact of modifications to model cloud schemes on the radiation budget. Jim Haywood presented a case study illustrating the potentially large radiative impact of contrail induced cirrus cloud, and discussed some of the uncertainties surrounding aviation-related cloud. The

meeting concluded with a challenging and stimulating evening address from Paul Hardaker, entitled 'The challenges for 21st century meteorology - for the science and the scientist'.

A full meeting report is due to appear in RMetS's "Weather" journal. Presentations can be downloaded from http://www.rmets.org/events/meeting/archive.php

Thanks to Curtis Wood and Richard Allan for organising and reporting on this event.

Implementing a Carbon Capture & Storage Cluster in the Next 5 Years.

Dr Stephen Brown, CO_2Sense
Swinden Technology Centre, Rotherham
Wednesday 30th March 2011

Peter Hodgson reports on this event attended by forty people, which was held jointly with Institute of Chemical Engineers and the Energy Institute.

Although humans have been deliberately burying carbon dioxide underground for at least several decades and the technologies to do so are largely proven, the implementation of carbon capture and storage (CCS) on a large scale is a controversial one for several reasons, some of which were explored in this talk. The focus of the talk was provided by the co-location in the Yorkshire & Humber region of several large emitters of carbon dioxide (power stations and other industry) with infrastructure required to transport and bury the CO_2 in gas fields under the North Sea. This cluster of industrial and geological "assets" is unique in Europe and, so the speaker argued, presents an unrivalled opportunity for the region to develop CCS capacity.

Following a description of four alternative processes that enable CO_2 to be captured with sufficient purity, the emphasis for the remainder of the talk was on the financial case for implementing CCS. Although significant initial investment would be required, for example to install pipelines with an initial over capacity, the long term financial benefits were presented. Several funding schemes and pilot and commercial scale studies were also described. The legal implications of storing carbon dioxide underground are currently unclear, but ways to resolve these issues, such as bilateral agreements between countries, were outlined.

13th International Conference on Electrostatics

Bangor University, Wales, UK
Sunday 10th – Thursday 14th April 2011

"Electrostatics 2011" was the 13th conference in the quadrennial series of International Electrostatics conferences, the first of which was held in 1953[1]. These conferences have substantial international attendance including delegates from Japan and the US and they are also highly interdisciplinary, with the topics now including bio-electrostatics, atmospheric electrostatics and environmental electrostatics. Electrostatics very definitely presents hazards to a range of industrial processes and to human endeavours. Lightning rods always remain of interest, as new designs can repeat old errors in the hope of generating commercial advantages. Many basic questions still remain intriguing, particularly in frictional electrification. For example, one paper demonstrated that the polarity on a balloon charged by rubbing with Teflon is opposite to when a balloon is inflated or deflated. Clearly, materials behave differently electrostatically when even modest stress is applied, requiring great care in experimental work. In addition to such fundamental research, there were many applications of electrostatics to environmental physics, which have been selected for the summary here.

Traditionally, the conference opens with a memorial lecture to Bill Bright, an inspirational professor of Applied Electrostatics at the University of Southampton who died in 1978. This conference's Bill Bright Lecture, the eighth, was given by Professor Giles Harrison from the Department of Meteorology at the University of Reading, on Fair Weather Atmospheric Electricity. This included a discussion on the development of instruments to measure atmospheric electrostatics in non-thunderstorm conditions, such as the electric field sensor developed by Lord Kelvin, and the current measuring apparatus of C.T.R. Wilson. Professor Harrison presented his own and co-workers' atmospheric electrical measurements made at the Reading Observatory site, which showed how different atmospheric electrical parameters are very strongly affected by different weather conditions. Charge measurements made on weather balloon platforms and applications of atmospheric electricity to air pollution, climate and earthquake detection were also discussed.

[1] It may help those checking the arithmetic to point out that the second conference was not held until 1967.

On the same theme of earthquake detection from atmospheric electrical measurements, Dr Hugo Silva of the University of Evora, Portugal, gave a presentation on observations of atmospheric electrical changes after the Sousel earthquake in Portugal. This earthquake occurred on 27th March 2010 and registered 4.1 on the Richter scale. Ground based measurements of electric field made from Evora, Portugal, situated 52km from the epicentre of the quake, showed a significant and sustained decrease in the electric field for a period of four days. The decrease in electric field is thought to be caused by the increased emission of radon after the earthquake, which increased the conductivity of the air and thus decreased the electric field. The duration of electric field suppression was similar to the half life of radon (3.8 days), further supporting the radon interpretation.

Measurements of charge in a variety of different atmospheric phenomena made from a balloon platform were presented by Dr Keri Nicoll from the University of Reading. Details of a specially developed charge sensor were discussed, as well as a comparison of charge measurements made in stratiform clouds, elevated layers of Saharan dust, and plumes of volcanic ash. Possible charging mechanisms in each of the three phenomena were discussed, and from the case studies presented, stratiform clouds were found to be an order of magnitude more highly charged than Saharan dust and volcanic ash plumes far from their source regions. At the conference dinner Keri was awarded a certificate and conference prize for Best Student Presentation, as this presentation was based on her recently completed PhD project work.

Dr Karen Aplin of the University of Oxford presented measurements of cosmic ray ionisation and natural radioactivity made from several sites around the UK. Over a period of several years, Geiger detectors have been deployed in high altitude locations (at Mt Snowdon, and Marchlyn Mawr, both in Snowdonia, Wales), and a low level site at Cheltenham. The sites have also been instrumented with a variety of meteorological sensors, including radiation sensors to measure down and up welling short and long wave radiation. The measurements offer both research and public engagement with science activity, with the data displayed on the web and linked to the Snowdon Weather Stations Project.

Dr Steve Lane of the University of Lancaster gave a summary of electrification in volcanic plumes, discussing a variety of field observations of volcanic plume charging, as well as laboratory based experiments investigating the charging ability of volcanic ash. Measurements of electric field beneath volcanic plumes have long been known to demonstrate strong changes when volcanic ash plumes have passed over the electric field sensor, indicating the presence of substantial charges in the base of volcanic plumes. Effects of charge on the ash particle interactions related to the long range transport of ash particles is currently poorly known, therefore further microphysical research is needed. It was noted that two

distinct types of lightning occur in volcanic plumes. These are: small discharges which are most common near the vent of the volcano, and thought to occur due to fractoemission; and much larger lightning strikes, which can often be between the ash plume and ground, thought to be linked to ice formation within the ash plume, with charge separation likely to be occurring in a similar way to thunderstorm electrification.

In two presentations, Dr James Matthews summarised the work of the Human Radiation Effects group at the University of Bristol investigating the effects of corona ions emitted by power lines on enhanced deposition of aerosol particles in human lungs, which has previously been linked to health problems, particularly the incidence of childhood leukaemia. Meteorological and atmospheric electrical measurements near a high voltage power line have established that fluctuations in the atmospheric electric field, and related effects on aerosol charging occur downwind, but not upwind of the power line. This indicates that the corona ions emitted have an effect on the charge state of airborne aerosol particles. Laboratory experiments are underway to generate aerosols with a similar charge distribution to those found near power lines, and to determine their biological effects.

Within an invited lecture, Dr Carlos Calle of the NASA Kennedy Space Center described the electrostatic environments of the Moon and Mars. The first astronauts reaching the Moon made the unexpected discovery that the abrasive, talc-like dust covering the surface of the Moon was readily charged by solar UV radiation (from which our stratospheric ozone layer protects us). This had real implications for the astronauts and spacecraft systems, as the dust covered the astronauts' helmets, and scratched them when it was wiped away. It also pervaded the spacecraft itself, where it was weightless after launch, making breathing difficult, and started to impede the operation of mechanical systems. Dr Calle and his team have been working on an electrostatic dust removal technique where electrodes are implanted into critical items (such as solar panels) and an alternating electric field applied which was demonstrated to rapidly clear the dust. This technology is likely to be used on any future Moon missions. It would also be of use on Mars, where charge causes the surface material to adhere to rover wheels, although there are yet to be any direct electrical measurements of the Martian environment.

Aerosols and the Environment

Institute of Physics, London.
Tuesday 19th April 2011.

Karen Aplin reports on this event attended by thirty-five people, which was held jointly with The Aerosol Society.

The Aerosol Society of UK and Ireland, which shares many common interests and goals with the EPG, usually holds its annual conference at Easter for two or three days, inviting submissions and publishing proceedings. However, this September, the European Aerosol Conference is being hosted by the UK Aerosol Society in Manchester. In place of the usual national Easter meeting the EPG organised a one day conference, co-sponsored by The Aerosol Society. The aim of the meeting was to present an overview of current research in the area, with invited talks, several posters and plenty of networking opportunities.

The first speaker was Prof Ian Ford (University College London) who presented the current state of research in theoretical aerosol science, focusing on nucleation. Ian motivated this work by referring to existing scientific issues requiring understanding of the behaviour of atmospheric aerosols, from nuclear disasters to geo-engineering. He outlined the classical nucleation theory that is frequently used, Becker-Döring theory, which is based on a slow "two steps forward, one step back" growth process, with the nucleation rate depending on growth and decay coefficients. However, we were cautioned against relying on classical nucleation theory, since it is not always appropriate to assume all molecules are spheres. Some other approaches to aerosol nucleation can be borrowed from other branches of physics or even chemistry, for example molecular dynamics simulations which can be used to determine the free energy of a cluster.

Aerosols in the indoor environment are often neglected, but Ian Colbeck (University of Essex) demonstrated that, as people can spend up to 90% of their time indoors, indoor air quality is highly important. In fact the mummified bodies of ancient cave dwellers which have been examined show smoke in their lungs, indicating this is a long-established problem. The majority of indoor aerosols arise from cooking, and this holds true in both developed and developing countries, in very different circumstances. Indoor aerosol concentration is related to the in situ production and loss rates, and also the rate at which outdoor particles are brought in. Measurements made at a heavily instrumented house in Oslo showed that the indoor aerosol mass concentration tracks the outdoor conditions except when

aerosol-generating activity is going on, e.g. frying food, burning a candle or vacuuming. Ian explained that the source strengths from different activities needed to be separated and used as model inputs, though the diversity of aerosol generation processes (e.g. folding laundry) will complicate matters. In developing countries the problems are far worse: 80% of the total global aerosol exposure occurs indoors, and women and children are particularly at risk, with indoor smoke concentrations at around $8mgm^{-3}$. Inefficient stoves cause 6-20% of combustible material to be converted into toxic substances, and there are many cultural challenges preventing the situation from improving.

Next Dr Claire Ryder (University of Reading) presented research on Saharan dust measurements. The Sahara is the major source of airborne dust, but the radiative effects of the dust are not well known. Dust can have either a net warming or a cooling effect on the atmosphere depending on its optical properties, and it is a major uncertainty in climate models. The radiative properties of dust are characterised by its refractive index, and the single scattering albedo, the ratio of scattering to extinction, and current estimates of these properties are highly variable. Claire described an aircraft campaign that flew through, above, and below dust layers near Dhakar. The single scattering albedo was found to be related to the refractive index, suggesting that aerosol composition was relevant rather than altitude or particle size. Lab measurements were used to estimate aerosol composition, and these estimates, together with measured parameters like the dust height profile were input to a radiative transfer code. Iteration of the code can then be used to give the “best fit” composition. As the radiative effects are very sensitive to composition it seems important to carry out more measurements of this sort in order to get these effects right in climate models.

After lunch Prof Colin O’Dowd of the National University of Ireland, Galway talked about organic atmospheric aerosol measured at the ultra-clean Mace Head Observatory in Western Ireland. Marine aerosol is formed by sea spray, waves breaking and bubbles bursting and contains considerable organic material. In fact the 4 ugm^{-3} of natural organic material measured in a typical plume last summer is a rival to polluted anthropogenic sources. The role of the organic material in the aerosol formation and growth is not yet known, although lab experiments with algae are underway. New results were presented showing nucleation bursts over the open ocean in addition to those observed relatively frequently near the coast. Enhanced levels of amines and hydrocarbon-based organic species were also detected at these times, and the hypothesis is that the amines are stabilising the clusters by reducing their evaporation rate, and the hydrocarbons promote their growth. Colin summarised by emphasising that marine aerosol is linked in a non-linear way to both biology and dynamics, and that the radiative effects of marine aerosols, on our ocean-covered planet, need to be better understood.

Staying with aerosol nucleation measurements, Dr Ben Murray (Leeds University) introduced us to the concept of a glassy material. Glassy materials are amorphous materials with some of the properties of both a liquid and a solid. For example, bitumen can be shattered if hit hard, but will flow like a fluid if left well alone. One experiment, leaving "solid" bitumen in a funnel at Brisbane University demonstrates this perfectly: since 1927 it has produced 8 drops of bitumen, and the next drop is overdue. Certain atmospheric aerosol species can take on these properties, such as iodic acid - as well as golden syrup when cooled in liquid nitrogen. These glassy aerosols are relevant to the nucleation of sub-visible layers of cirrus in the upper tropical troposphere, which are, like all aerosols, radiatively important. The conditions at these levels are suitable for forming glassy aerosols, and in experiments carried out at the AIDA facility in Germany it was discovered that they could act as ice nuclei at temperatures less than 212K.

The April-May 2010 eruption of the Eyjafjallajokull eruption in Iceland was described from an eye witness perspective by Dr Evgenia Ilyinskaya of the Icelandic Met Office, together with her analysis of aerosol data obtained. An unusual characteristic of this eruption was the amount of fine ash generated, which, as well as causing massive disruption to European air traffic, remains a substantial problem to Iceland's infrastructure when the deposited dust is re-suspended. Evgenia discussed how the eruption had moved from a curiosity "tourist" eruption initially, to an eruption with a prolonged phase of explosive activity. She demonstrated the variability in the plume generation, and showed changes in the retrieved aerosol size distributions associated with the different eruption phases. The overall atmospheric mass loading remains to be quantified in detail, but an ash output rate of $10^5 kgs^{-1}$ seems probable. 30% of the ash fall observed in Iceland between 15th and 17th April was less than 18 microns diameter, and up to 7% was less than 1micron diameter. A further interesting aspect of the early phase of the eruption (between 14th and 17th April) was that none of the "usual" volcanic gases (SO2, HCl and HCF) were able to be detected.

Forthcoming Environmental Physics Group Events

Environmental Physics Day

Institute of Physics, London
Wednesday 25th May 2011

The ***EPG Environmental Physics Day*** provides an excellent opportunity for the community to get together and discuss the diversity and depth of environmental physics. The day will see a mix of presentations from environmental physicists from a variety of disciplines, including the EPG essay winners. The meeting will also incorporate the Group's AGM. In the evening, Prof John Shepherd will

present a talk (held jointly with the London and South East Branch) on '**Geoengineering the Climate: an Overview and Update'**.

*The **Environmental Physics Day*** will be a relaxed and friendly event to discuss environmental physics and find out more about the Group and its members. The event is open to all EPG members (non-members are welcome, subject to a registration fee of £10), from students to those more experienced members. **Travel grants** are available, and students are particularly welcome to apply for these.

Speakers for the members' meeting include:

Helen Dacre, University of Reading "The prediction and observation of volcanic ash clouds during the Eyjafjallajökull eruption"

Terri Jackson "Climate Change - Natural, man made or both?"

Anne Silk, John Radcliffe Hospital, Oxford "Bioelectromagnetics - some unforeseen Societal problems"

Simon Buckle, Grantham Institute for Climate Change, Imperial College "Climate physics and the economics of climate change"

A full list of speakers and programme will be emailed out to members shortly – please keep an eye open for updates to the programme!

Environmental Physics Day commences at **1pm** for lunch, with presentations starting at 1.45pm. After a short **AGM** at **5.40pm**, we will join the London and South East Branch at 6pm, with the **evening lecture** commencing at **6.30pm**. Tea and coffee will be available after the event.

Further details of the day will be posted on the **EPG website** (under the Group calendar tab) at http://www.iop.org/activity/groups/subject/env/index.html

To assist with catering requirements, please return the form at the back of the newsletter by **13th May** to Chris Lavers via email, fax or post.

Geoengineering the Climate: An Overview and Update

Professor John Shepherd FRS
Institute of Physics, London
Wednesday 25th May. Tea/coffee from 6.00pm, meeting starts at 6.30pm.

Environmental Physics Day Evening Lecture held jointly with the London and South-East Branch.

The climate change we are experiencing now is caused by an increase in greenhouse gases due to human activities, including burning fossil fuels, agriculture and deforestation. There is now widespread belief that a global warming of greater than 2°C above pre-industrial levels would be dangerous and should therefore be avoided. However, despite growing concerns over climate change, global CO_2 emissions have continued to climb. This has led some to suggest more radical "Geoengineering" alternatives to conventional mitigation via reductions in CO_2 emissions.

Geoengineering is deliberate intervention in the climate system to counteract man-made global warming. There are two main classes of geoengineering; direct carbon dioxide removal, and solar radiation management, which aims to cool the planet by reflecting more sunlight back to space. The findings of the review of Geoengineering carried out by the Royal Society (see http://royalsociety.org/document.asp?tip=1&id=8770) are summarised, including the climate effects, costs, risks, and research and governance needs for various approaches. The possible role of geoengineering in a portfolio of responses to climate change is discussed, and various recent initiatives to establish good governance of research activity are reviewed. Key findings include:

- Geoengineering is not a magic bullet and not an alternative to emissions reductions.
- Cutting global greenhouse gas emissions must remain our highest priority
  - But this is proving to be difficult, and Geoengineering may be useful to support it
- Geoengineering is very likely to be technically possible
  - However, there are major uncertainties and potential risks concerning effectiveness, costs and social & environmental impacts
- Much more research is needed, as well public engagement and a system of regulation (for both deployment and for possible large-scale field tests)
- The acceptability of geoengineering will be determined as much by social, legal and political issues as by scientific and technical factors

To assist with catering requirements, please return the form at the back of the newsletter by **13th May** to Chris Lavers via email, fax or post.

The greenhouse effect and global warming: celebrating the work of John Tyndall

Dublin Castle, Dublin, Ireland
Wednesday September 28th to Friday 30th September 2011

The Royal Irish Academy and the Environmental Protection Agency are holding a scientific conference on 28-30 September 2011, in Dublin, Ireland, to mark the 150th anniversary of the publication of John Tyndall's breakthrough experimental work on the absorption of infrared radiation by various atmospheric gases that are essentially transparent to solar radiation

John Tyndall's work is at the heart of current concerns about global warming and associated climatic and environmental changes. The Tyndall Conference 2011 will celebrate John Tyndall as a pioneer in climate science. The conference will also explore a number of contemporary issues in the science of the greenhouse effect and global change. It will adopt as a special theme the climatic influences of different radiatively active substances in the atmosphere. This will include approaches to the aggregation of the effects of GHG emissions in terms of their global warming potentials, as well as other metrics for long-lived and short-lived greenhouse gases and metrics for aerosols. It will also the explore the current science of climate feedbacks, which determine the climate system's equilibrium response to given forcings.

The conference is intended to highlight the continuing relevance of Tyndall's work and advance the science internationally in the areas of common metrics for radiatively-active substances and the associated feedbacks.

The Environmental Physics Group is pleased to sponsor this event. Further information can be found: http://www.tyndallconference2011.org/ Registration for the conference is until 15th July 2011.

Forthcoming IOP Events

PetroPhase 2011: 12th International Conference on Petroleum Phase Behavior and Fouling

Imperial College, London,
Sunday 10th – Thursday 14th July 2011

Topics in this conference include petroleum phase behavior, the formation and mitigation of organic solid phases, emulsions and colloids, desalting, and the structure and composition of heavy oils, asphaltenes, and trace contaminants. The early registration deadline is 3rd June 2011.

For further information on this event visit the website at http://petrophase.iop.org

Sensors and their Applications XVI

Clarion Hotel, Cork, Ireland
Monday 12th- Wednesday 14th September 2011.
Organised by the IOP Information, Science and Technology Group.

The sixteenth in the series of conferences on Sensors & their Applications (S&A XVI) will be hosted by Tyndall National Institute at University College Cork, Ireland in September 2011. This popular event follows previous conferences in the series that began in Manchester in 1983 and included the first of the highly successful Eurosensors conference at Cambridge in 1987 and at Southampton in 1998.

The S&A series of conferences provides an excellent opportunity to bring together scientists and engineers from academia, research institutes and industrial establishments to present and discuss the latest results in the field of sensors, instrumentation and measurement.

For more information, see: http://instituteofphysics.createsend4.com/t/r/l/ahuhuk/kltkkihit/yd

Other Forthcoming Events

The Mathematics of the Climate System

University of Reading
Monday 12th- Thursday 15th September 2011.

This conference will be about the construction and use of mathematical models of the climate system. Such models aid our understanding of how certain climate processes interact. They also enable us to assess, interpret and diagnose more comprehensive climate models. Finally, they provide readily understandable paradigms for dynamical climate-system behaviour. The conference will focus on three related topics:

1) the extraction of mathematical models from climate data and climate-model output (homogenisation, stochastic model reduction, bistability and metastable states, low frequency variability, data-driven coarse-graining, set-oriented methods, trend identification, time-series analysis);

2) reduced models and their dynamics (linear response theory, bifurcations, extreme events, uncertainty); and

3) testing hypotheses about the climate system using statistical frameworks (emulators, Bayesian methods, nonparametric methods, equitability).

Call for Papers
Papers will be accepted for the conference based on a 100-200 word abstract. Abstracts should be submitted by 6 May 2011 either online at http://online.ima.org.uk/ or by email to conferences@ima.org.uk

For further details of the conference, see
http://www.ima.org.uk/Conferences/mcs2011.html

Other Activities

Volunteers wanted for Physics in the Field

Throughout summer 2011, the Institute's physics in society team and local branches will be taking physics to festivals and events around the country, engaging thousands of families and young people with physics busking. Physics busking involves performing physics tricks – small hand held demonstrations which help illustrate an area of physics – and encouraging visitors to try the tricks themselves. By busking at non-science events we aim to raise awareness of physics among people who wouldn't normally choose to seek out science. The IOP is looking for volunteers to help out at festivals all over the country from May to October.

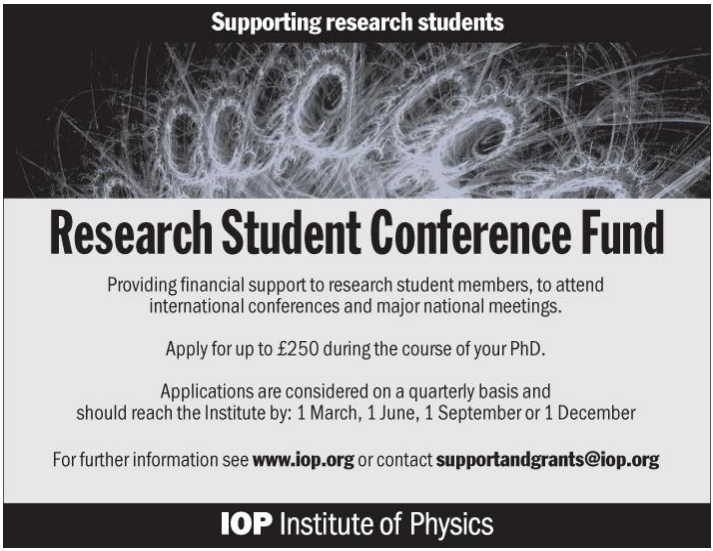
The volunteer's role is to ensure that visitors enjoy themselves and have a positive experience of physics. You will encourage visitors to try the different tricks we have available, talk to them about the physics behind the tricks and, when the opportunity arises, describe some of your own research or work in physics for those more interested visitors.

All volunteers will receive full instructions and training on how to perform the physics tricks, including presentation tips. The training and experience you receive will be an excellent introduction to physics outreach as well as helping you develop important transferable skills.

If you are interested in volunteering with us this summer then please contact the Physics in Society team on physics.society@iop.org

Research Student Conference Fund

Each year the group is allocated funds for students to apply for financial assistance to attend environmental-physics related international conferences and major national meetings. We are pleased to sponsor students at events such as these, and students are welcome to apply for up to £250 during the course of their studies. Please see the advert below for further details.



CEDA Repository

Past EPG newsletters are presently hosted at the Centre for Environmental Data Archival (CEDA) based at the STFC Rutherford Appleton Laboratory (see page 5). The repository hosts a range of activities associated with environmental data archives and the content is publicly available. Data and publications uploaded cover a range of environmental physics, and provide a great way of permanently sharing information with a wide audience. Items are easy to upload, and EPG members are invited to investigate and upload items onto the site. For further information, see http://cedadocs.badc.rl.ac.uk/

Getting chartered workshops

Have you ever thought about applying for Chartered status but are not sure how to go about it? Are you unsure of the requirements or put off by the forms?

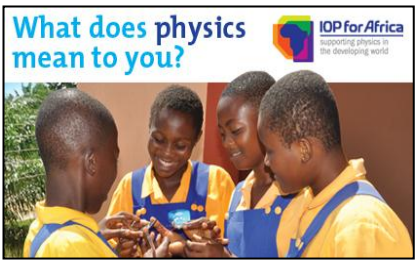
The IOP are holding a number of workshops nationwide aimed at providing information and answering any questions you may have about the application process.

The workshops will cover:

- *The benefits of getting chartered*
- *The two designations (CPhys and CEng) offered by the Institute and the differences between them*
- *The requirements and application process*
- *Making an effective application*

These workshops are free of charge and are open to IOP members only; places are limited and must be booked. These workshops can also be run in-house for your company. Please email CPD@iop.org for further information

IOP for Africa: An update on the campaign for physics education



IOP for Africa, the Institute's campaign to raise funds in support of its Physics for Development programme which began in December, has now raised more than £20,000 thanks to the generosity of IOP members.

Thank you to all who have donated so far. If you would like to find out more or make a donation, please visit the website **www.iop.org/iopforafrica**

Environment Engineering: The Fiona and Nicholas Hawley Award

The Worshipful Company of Engineers (WCE) is seeking entries for this years Fiona and Nichsolas Hawley award to enable young engineers to develop innovative solutions to environmental problems.

The £5,000 award is for early-career engineers, who can demonstrate that they have developed, to prototype or proof of concept stage, an application of proven technology that contributes to social, economic and environmental sustainability.

The interpretation of "Environmental Engineering" is extremely wide and not limited to any particular discipline. Winning entries in past years have come from numerous disciplines, and have included:

- the development of a "no moving parts" pump;
- the treatment of oil contaminated drill cuttings;
- the use of waste vegetable oil as a bitumen replacement in asphalt mixtures.

Written submissions should be made to the Worshipful Company of Engineers and include a report of no more than 1,000 words. Submissions close on Monday 16th May 2011. For more details, see http://www.engineerscompany.org.uk/

Environmental physics word search

For those who would like a challenge during a coffee break. Good luck!

Words to find:

agriculture, astronomy, chemistry, climate, education, electrostatics, energy, environment, geology, geophysics, health, hydrology, meteorology, oceanography, physics, pollution, renewable, sensors, soil, transport.

EPG Committee

Chair: Prof. Pat Goodman		Physics Department, Dublin Institute of Technology, Kevin Street, Dublin 8 **Tel:** + 353 1 4024782, **Fax:** + 353 1 4024988 **e-mail:** pat.goodman@dit.ie
Treasurer: Dr Karen Aplin		Physics Department, University of Oxford, Denys Wilkinson Building, Keble Road, Oxford, OX1 3RH. **Tel:** 01865 273491 **Fax:** 01865 273418 **e-mail:** k.aplin1@physics.ox.ac.uk
Hon. Secretary: Dr Paul Williams		National Centre for Atmospheric Science, Dept. of Meteorology, The University of Reading, PO Box 243, Earley Gate, Reading, RG6 6BB. **Tel:** 0118 378 8424, **Fax:** 0118 378 8316. **e-mail:** p.d.williams@reading.ac.uk
Communication (Newsletter): Dr Sally Brown		School of Civil Engineering & the Environment, University of Southampton, Highfield, Southampton, SO17 1BJ. **Tel**: 02380 594796, **Fax:** 02380 677519 **e-mail:** sb20@soton.ac.uk
Communication (Web): Dr A. Hugh Mortimer		Space Science and Technology Department, Rutherford Appleton Laboratory, Chilton, Didcot, Oxon, OX11 0QX. **Tel:** 01235 446746, **Fax:** 01235 446434 **e-mail:** hugh.mortimer@stfc.ac.uk
Dr Alec Bennett		The Met Office, FitzRoy Road, Exeter, Devon EX1 3PB **Tel:** 01392 884076, **Fax:** 01392 885681 **e-mail:** alec.bennett@metoffice.gov.uk
Dr Alison Buckley		Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency, Chilton, Oxfordshire, OX11 0RQ **Tel:** 01865 822640 **e-mail:** alison.buckley@hpa.org.uk
Prof. Ian Colbeck		Institute for Environmental Research, Dept. of Biological and Chemical Sciences, University of Essex, Wivenhoe Park, Colchester CO4 3SQ. **Tel:** 01206 872 203, **Fax:** 01206 872592, **e-mail:** colbi@essex.ac.uk
Dr Mhairi Coyle		CEH Edinburgh, Bush Estate, Penicuik, Midlothian, EH26 0QB. **Tel:** +44(0) 131 445 8574. **Fax:** +44(0) 131 445 3943 **e-mail:** mcoy@ceh.ac.uk

Prof. R. Giles Harrison		Dept. of Meteorology, The University of Reading, PO Box 243, Earley Gate, Reading, RG6 6BB. **Tel:** 0118 9316690 **Fax:** 0118 378 8316 **e-mail:** r.g.harrison@reading.ac.uk
Dr Peter Hodgson		Environment Department, Tata Steel RD&T, Swinden Technology Centre, Moorgate, Rotherham, United Kingdom, S60 3AR **Tel:** 01709 825478 **Fax:** 01709 825400 **e-mail:** Peter.Hodgson@tatasteel.com
Dr Chris Lavers		University of Plymouth at Britannia Royal Naval College, College Way, Dartmouth, Devon, TQ6 OHJ. **Tel:** 01803 677218 **Fax:** 01803 677015 **e-mail:** brnc-radarcomms1@nrta.mod.uk
Dr Curtis Wood		Dept. of Meteorology, The University of Reading, PO Box 243, Earley Gate, Reading, RG6 6BB. **Tel:** 0118 378 6721 **Fax:** 0118 378 8316. **e-mail:** c.r.wood@reading.ac.uk

This newsletter is also available on the web and in larger print sizes

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

The Institute of Physics, 76 Portland Place, W1B 1NT, UK.

Tel: 020 7470 4800
Fax: 020 7470 4848

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REPLY FORM FOR ENVIRONMENTAL PHYSICS DAY AND EVENING LECTURE ON GEOENGINEERING

PLEASE RETURN TO CHRIS LAVERS (SEE PAGE 27 FOR CONTACT DETAILS)

To assist with catering requirements, please state whether you will be present.

I intend to come to the Environmental Physics Group Environmental Physics Day and/or evening lecture on Wednesday 25th May 2011.

□ Environmental Physics Day – afternoon □ Evening lecture □ Both (please tick)

Name: _

Address: _

Tel/email: _