Seismogram of the Market Rasen earthquake which occurred on 27th February 2008, provided by the British Geological Survey. Other earthquake-related data, including public perception surveys are available at http://www.earthquakes.bgs.ac.uk/
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents</td>
<td>2</td>
</tr>
<tr>
<td>Reports from the Chair and Secretary</td>
<td>3</td>
</tr>
<tr>
<td>Chair’s Report for AGM, 14\textsuperscript{th} May 2008</td>
<td>3</td>
</tr>
<tr>
<td>Group Meetings/Visits</td>
<td>3</td>
</tr>
<tr>
<td>Events in 2008</td>
<td>3</td>
</tr>
<tr>
<td>Other Proposed Events</td>
<td>4</td>
</tr>
<tr>
<td>Essay Competition</td>
<td>4</td>
</tr>
<tr>
<td>Other Activities &amp; News</td>
<td>4</td>
</tr>
<tr>
<td>Thanks</td>
<td>5</td>
</tr>
<tr>
<td>Secretary’s Report for AGM, 14\textsuperscript{th} May 2008</td>
<td>5</td>
</tr>
<tr>
<td>Membership</td>
<td>5</td>
</tr>
<tr>
<td>Committee composition</td>
<td>5</td>
</tr>
<tr>
<td>Thanks</td>
<td>6</td>
</tr>
<tr>
<td>News</td>
<td>7</td>
</tr>
<tr>
<td>One Year of Environmental Research Letters</td>
<td>7</td>
</tr>
<tr>
<td>Environmental Physics Teaching Resources</td>
<td>7</td>
</tr>
<tr>
<td>2007 Essay Competition</td>
<td>8</td>
</tr>
<tr>
<td>Annual General Meeting</td>
<td>10</td>
</tr>
<tr>
<td>Reports from previous events</td>
<td>11</td>
</tr>
<tr>
<td>Severe weather - origins and prediction (4th February 2008)</td>
<td>11</td>
</tr>
<tr>
<td>Climate Change: The Physical Science Basis (28th February 2008)</td>
<td>11</td>
</tr>
<tr>
<td>Condensation Processes (29th Feb 2008)</td>
<td>12</td>
</tr>
<tr>
<td>Forthcoming Events</td>
<td>13</td>
</tr>
<tr>
<td>Environmental Physics Group Members’ Meeting</td>
<td>13</td>
</tr>
<tr>
<td>The Windscale nuclear reactor accident - 50 years of investigations</td>
<td>15</td>
</tr>
<tr>
<td>Sustainable Energy: new solutions from Physics and Engineering</td>
<td>16</td>
</tr>
<tr>
<td>EPG Committee</td>
<td>18</td>
</tr>
</tbody>
</table>
Reports from the Chair and Secretary

Chair’s Report for AGM, 14th May 2008
Welcome to the Chair’s report. The year behind us was perhaps the busiest in the recent history of the Group, with a very healthy number of meetings in a variety of locations, and a range of other activities, including the essay competition and the start of a process to develop educational resources in environmental physics. This year already looks to be another busy one and I hope that you will be able to get benefit from and support the Group in some way or other during the year.

Group Meetings/Visits
Thanks to all who contributed to the programme of events in 2007, including speakers, organisers and those who supported with their attendance.

Table 1: 2007 Meetings

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Type</th>
<th>Venue</th>
<th>Joint with …</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/02/07</td>
<td>Extreme weather</td>
<td>Eve</td>
<td>York</td>
<td>Y&amp;H Branch</td>
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<tr>
<td>24/04/07</td>
<td>Extreme weather</td>
<td>Eve</td>
<td>Middlesboro’</td>
<td>NE Branch</td>
</tr>
<tr>
<td>02/05/07</td>
<td>Members’ Meeting</td>
<td>½ day</td>
<td>London</td>
<td></td>
</tr>
<tr>
<td>02/05/07</td>
<td>Rainbows, Haloes &amp; Glories</td>
<td>Eve</td>
<td>London</td>
<td>L&amp;SE Branch</td>
</tr>
<tr>
<td>02/06/07</td>
<td>Environmental Physics day</td>
<td>Day</td>
<td>Dundee</td>
<td>Scottish Branch</td>
</tr>
<tr>
<td>13/06/07</td>
<td>Climate Change-the physical basis</td>
<td>Eve</td>
<td>London</td>
<td>L&amp;SE Branch</td>
</tr>
<tr>
<td>17/10/07</td>
<td>Optical Environmental Sensing V</td>
<td>Day</td>
<td>NAC, Warwickshire</td>
<td>Optical Group</td>
</tr>
<tr>
<td>06/12/07</td>
<td>Windscale fire 50th anniversary</td>
<td>Eve</td>
<td>Dublin</td>
<td>Irish Branch</td>
</tr>
</tbody>
</table>

Events in 2008
The Group is continuing to plan events around the country, with the aim of making the activities of the Group accessible to a greater number of members and non-members alike. Already this year events have taken place in England and Ireland, whilst others are planned later for Scotland and Wales.
• Extreme weather, with South Central Branch, Southampton, January 2008
• Climate Change-the physical basis, Dublin, 28th February 2008.
• Condensation Physics, with Irish Branch & Aerosol Society, Dublin, 29th February 2008.
• Members meeting & evening lecture, London, 14th May 2008
• Optical Environmental Sensing VI, with Optical Group, Edinburgh, August 2008

The committee has for some time wanted to organise activities in quick response to major environmental physics news stories. The Market Rasen earthquake in February has provided a good opportunity to do so and we have started to plan for one or more meetings on that theme.

Other Proposed Events

• Media reporting of environmental news stories.
• Meeting with Computational Physics Group.
• Meeting with Combustion Physics Group.

The Group has also contributed to the planning of a meeting on Sustainable Energy, organised by the Applied Physics & Technology Division, to be held on 29th October 2008, in London. Further details are given later in this Newsletter.

Essay Competition

The 3rd EPG essay competition was launched in the autumn of 2007. The number of entries was fewer than in previous years, perhaps due to the fact that we were unable to advertise the level of prize money at the time that entries were being sought. Nonetheless the essays were again of high quality, with two outstanding. Louise St. Germain, who considered the environmental physics in the design and siting of buildings, was declared the winner and awarded a £350 prize. Stephen Sheen, a physics undergraduate at the University of Leeds, wrote about renewable energy and was awarded a prize of £150 as runner-up. I would like to thank Gary Williams for the publication of last year’s winning essays in Physics Education; publication of the latest winners is currently being sought.

Other Activities & News

In December 2007, a workshop was held to explore the development of educational resources for environmental physics. Thanks to Peter Hughes for taking up the initiative on behalf of the EPG. A new bursary fund (RSCF) has been established for postgraduate researchers attending major conferences. Applicants must be members of a Group of the Institute and should approach the Institute in the first instance. Two Newsletters were published by the Group during...
the year; this (along with the web-pages) is the key means by which the Group’s activities are publicised and contributions from members are always welcome.

Thanks
I must express my thanks to all members of the EPG committee, who are extremely dedicated and hard-working in the cause. It is no coincidence that the Group has been cited in several respects as demonstrating good practice within the IOP. Worthy of particular mention are the Newsletter & web editors, Karen Aplin & Paul Williams, the Treasurer & Vice-Chair, Giles Harrison and our Secretary, Pat Goodman.

Peter Hodgson (Chair)
March 2008

Secretary’s Report for AGM, 14th May 2008

Membership
The Environmental Physics group membership has shown quite a significant growth. Currently there are 523 members (April 2008), up from 444 this time last year, up almost 20%. This increase in membership of the group is very important and we believe is partly due to the increased awareness of environmental issues and the role physicists can play. It is important that all our members participate and feel part of the group; we encourage people to consider being part of the committee.

The Environmental Physics Group Committee met on 2nd May 2007 (9 attendees), 26th September 2007 (11 attendees) and 28th February 2008 (held in Dublin, 11 attendees).
The AGM was held on 2nd May 2007 (24 attendees)

Committee composition
The current committee, with the individuals’ expiry dates, is listed in Table 2 below. (Officers serve 3 years, and Ordinary members 4 years.)
Table 2: 2007-8 Committee Members

<table>
<thead>
<tr>
<th>name</th>
<th>status</th>
<th>start</th>
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<tr>
<td>Karen Aplin</td>
<td>elected</td>
<td>2007</td>
<td>2011</td>
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<tr>
<td>Alastair McCartney</td>
<td>Co-opted</td>
<td>June 2007</td>
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<tr>
<td>Derek Rose</td>
<td>ordinary</td>
<td>Elected May 2005</td>
<td>2009</td>
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<tr>
<td>Edward Youngs</td>
<td>Co-opted</td>
<td>Co-opted 2007</td>
<td></td>
</tr>
<tr>
<td>Giles Harrison (Hon Treasurer/Vice Chair)</td>
<td>officer</td>
<td>Elected May 2006</td>
<td>2009</td>
</tr>
<tr>
<td>Ian Colbeck</td>
<td>ordinary</td>
<td>Elected May 2005</td>
<td>2009</td>
</tr>
<tr>
<td>John Garland</td>
<td>ordinary</td>
<td>Elected May 2005</td>
<td>2009</td>
</tr>
<tr>
<td>Peter Hodgson (Chairman)</td>
<td>officer</td>
<td>Elected May 2006</td>
<td>2009</td>
</tr>
<tr>
<td>Peter Hughes</td>
<td>ordinary</td>
<td>Elected May 2005</td>
<td>2009</td>
</tr>
<tr>
<td>Pat Goodman (Hon Secretary)</td>
<td>officer</td>
<td>Elected May 2006</td>
<td>2009</td>
</tr>
<tr>
<td>Paul Williams</td>
<td>ordinary</td>
<td>Elected May 2004</td>
<td>2008</td>
</tr>
<tr>
<td>Ian Rutt</td>
<td>ordinary</td>
<td>Elected May 2005</td>
<td>2009</td>
</tr>
<tr>
<td>Sally Brown</td>
<td>ordinary</td>
<td>Elected May 2007</td>
<td>2011</td>
</tr>
<tr>
<td>Keith De Blanger</td>
<td>Co-opted</td>
<td>Co-opted May 2007</td>
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</tr>
</tbody>
</table>

We have at least one vacancy for an ordinary member on the committee, nominations should be sent to the Hon. Secretary.

Thanks
I am grateful to all of the committee members for their assistance over the past year.

Pat Goodman (Hon. Secretary)
March 2008
News

One Year of Environmental Research Letters

The beginning of 2008 marked the first complete year of Environmental Research Letters (ERL) (http://www.iop.org/EJ/erl). The entire ERL team would like to extend its warmest thanks to all those that helped us during the first year including the editorial board, authors, reviewers and of course all of the many readers that have visited ERL over the last year.

2007 was an excellent year for environmental research letters that saw several key landmarks for the journal. In addition to the regular content ERL launched 5 focus issues designed to showcase the latest research in the fields of the health effect of Environmental Justice, PM air pollution, High latitude climate change, Wind Energy and Greenhouse Gas emissions and Deforestation. As well as the excellent copy flow ERL has had outstanding readership with ERL articles having been downloaded over 50,000 times. Finally ERL has managed to achieve one of the primary goals of any new journal, by being listed in Thompson ISI and is due for its first impact factor in 2009.

Last year IOP Publishing launched two companion environmental products to widen the service provided by ERL. February 2007 saw the arrival of environmentalresearchweb (http://environmentalresearchweb.org/cws/home), a community website dedicated to providing news and analysis on all aspects of environmental change, as well as resources such as jobs, events and company listings, and a free weekly email newswire. Over the last year environmentalresearchweb has gone from strength to strength and now boasts over 3000 members with many more regular readers. Following this in November IOP Publishing launched IOP Conference Series: Earth and Environmental Science (EES) (http://www.iop.org/ej/journal/ees), an open access proceedings service based on our hugely successful proceedings in physics. In its short lifetime EES has already been commissioned to provide proceedings for several high profile events.

Keith de Blanger

Environmental Physics Teaching Resources

The Group has begun to work with the IOP in developing environmental physics resources in support of teachers. In the first instance, a couple of commentaries are being sought, to see how they might work out and to act as an exemplar for
others. The commentaries should be focused on providing information for (non-physics specialist) teachers at A level / 1st year university standard and be around 1500 – 2000 words in length. These commentaries are to help teachers and not necessarily for them to use directly with their students. They could be accompanied by some PowerPoint slides that would have images/ diagrams/ graphs to illustrate the commentaries and might be used by teachers in their teaching. Thus the commentaries should be fairly focused on some particular aspect, rather than aiming for a too ambitious overarching view of a whole area of environmental physics.

If you might be interested in producing a commentary and are able to do this in a fairly short time frame (ideally by the end of May), please contact Clare Thomson, details below, who will be able to provide more information on potential topics and content.

Clare Thomson FIInstP
Curriculum Support Manager
Institute of Physics
Tel: 020 7470 4981
email: clare.thomson@iop.org

2007 Essay Competition

There were only 7 entries for the Essay Competition this year. This number compares with 16 entries last year and 21 in the previous year, when the competition was launched. However, the judges were pleased that the quality of the entries remained high. Even with fewer entries, the topics covered a whole range of topics, including earthquake prediction, the salinity of waters in the Antarctic, surveying for groundwater, renewable energy, environmental physics considerations of urban development, and the intriguingly titled “Can iPods grow on trees?”.

The judges, Peter Hodgson, Keith de Blanger, Alastair McCartney, Derek Rose and Edward Youngs, decided to award two prizes this year. The first prize of £350 was awarded to Louise St Germain from Ottawa, for her essay entitled “Suburbia 1, Kyoto 0 – Why Canadians must link home to environment to achieve Canada’s Kyoto targets”. She argued the need for environmental physics in the design and layout of housing developments in order to reduce greenhouse gas emissions. The second prize of £150 was awarded to Stephen Sheen from the University of Leeds for his essay “It’s not easy being green! - A look at the limitations of some renewable energies”.

8
Publication of both these winning essays is now being sought (last year’s winners appeared in Physics Education) and they will also be available on the EPG website in due course. The winners will also be invited to present their essays at the Members’ Day on Wednesday 14 May where they will be presented with their prizes accompanied by a certificate from the Institute of Physics.

The committee thanks all those who entered the competition, congratulates the winners, and looks forward to receiving entries for the 2008 competition.

Edward Youngs
Annual General Meeting

Wednesday 14th May 2008, 5.45pm, Institute of Physics

The 17th Annual General Meeting of the Institute of Physics’ Environmental Physics Group will be held on Wednesday 14th May 2008 at 5:45pm. The meeting will be held in the Lovelace room at the Institute of Physics.

This year there are several vacancies for Ordinary Committee members.

Please send nominations for the above vacancies to the Secretary of the EPG, to arrive not later than twenty-eight days before the AGM. The nominations should be proposed by at least two members of the Group and should be accompanied by the written consent of the nominee.

This is YOUR chance to become more involved with the Group and to make a difference. If you would like to know more about what might be involved, please contact Pat Goodman or Peter Hodgson (contact details at the end of this Newsletter) for an informal discussion.

This year’s AGM will be held during the EPG Members’ meeting, at which attendees will get the chance to hear a range of talks on environmental physics topics. Following the AGM, there will be a lecture on ‘The Windscale nuclear reactor accident - 50 years of investigations’, by Professor Richard Wakeford of Manchester University. Separate notices in this Newsletter give further details.

A limited number of EPG travel grants may be available to assist members of the EPG attending the Members’ meeting; contact the Secretary or Chair for further details.

We look forward to seeing you at the AGM.

Pat Goodman (Hon. Secretary)
Peter Hodgson (Chair).
Reports from previous events

Severe weather - origins and prediction (4th February 2008).

It's a dangerous world out there, according to Ross Reynolds of Reading University. That's if you happen to be the wrong place at the wrong time, coming across 1kg hailstones travelling at 48m/s, and up to 318mph wind speeds associated with tornadoes.

Fortunately, these are not common occurrences as Ross went on to explain during an evening seminar on Severe Weather at Southampton University held jointly with the South Central Branch. In his talk he discussed what conditions are required and how thunderstorms and tornadoes form and he gave some particularly good examples from Oklahoma. Knowledge of formation conditions for tornadoes is well-known and can be predicted in advance but predicting exactly when and where they form and touchdown is another matter. He also explained the risks associated with thunderstorms and severe weather and the damage they cause.

By the end of the seminar, I found it hard to believe the English author and art critic, John Ruskin's phrase of 'there is really no such thing as bad weather, only different kinds of good weather,' with the destructive forces, high winds and the great damage these phenomena cause. Accompanied by satellite imagery, photographs and video footage (filmed by some rather daring students), this enlightening talk showed how to be frightened and thrilled by these natural phenomena and created a whirlwind of discussion and questions at the end.

Sally Brown


Around 30 people came to the Dublin Institute of Technology to hear Professor Jonathan Gregory's talk about climate change.

Jonathan was a lead author of the IPCC's (Intergovernmental Panel on Climate Change) recent fourth assessment report. He is a Professor at the University of Reading. He talked about how glaciers, ice sheets, forests, vegetation, water
vapour and precipitation are influenced by climate change and also contribute to it. He discussed state-of-the-art climate models and their uncertainties.

He said that although models (and scientists) disagree over the exact details of climate change, overall there is agreement between the various models that the climate is changing and that this is due to human activity and industrialisation over the past 250 years.

Paul Williams

**Condensation Processes (29th February 2008)**

In keeping with the policy of holding some of the group events outside of London, to try and bring talks to our members in the branches, a half-day meeting on “condensation processes” in environmental physics was held in Dublin on 29th Feb. 2008. This meeting was organised in conjunction with the Aerosol Society and with assistance from the Irish Branch of IOP, and chaired by Dr Frank McGovern of the Irish EPA. There were 5 excellent speakers who spoke on diverse aspects of condensation in the atmospheric environment.

The first speaker was Dr. Darius Ceburnis from the National University of Ireland Galway, who presented work on Condensation, Atmospheric Aerosol Growth, and Climate Impacts, conducted by him and colleagues including Prof. Colin O’Dowd at the Mace Head site in Galway. Darius showed that a significant amount of the natural marine aerosol detected at Mace Head could be linked to Iodine from seaweed and that this was an important source of natural aerosol, with a significant role in atmospheric processes.

This was followed by a talk from Dr Tony Scott, UCD, Dublin, (former treasurer of the IOP), Tony spoke on the development and evolution of the condensation nucleus counter. Tony worked with PJ Nolan (of the Nolan Pollak Nucleus counter fame). He showed original photos of the early nucleus counters, and spoke of how Nolan and Pollak differed on their views as to developing the counter, each taking quite different approaches. He presented data on how the Nolan counter was evaluated, with them testing various lengths and diameter of the sample tube, only to find that the original tube was the most efficient. It had initially been chosen as it was the only metal tubing available in the workshop during the shortages of the second world war!

The final speaker in the first session was Dr Charles Clement who spoke on Fluctuations and Condensation in Clouds. Charles emphasised the importance of this work in relation to representing cloud in climate models, where the cloud
formation aspects are not parameterised in terms of fluctuations. He demonstrated that this is a weakness in current models, and presented interesting data on condensation process within clouds illustrating the fluctuations that are observed in the atmosphere.

After lunch there were two further speakers, the first being Dr Giles Harrison (Reading, and Vice-Chair of the EPG). Giles spoke on Surface observations of cloud changes associated with cosmic rays. His talk was based on observations at ground stations around the UK over 50 years, where both direct and diffuse solar radiation measurements were made at the same locations. Giles presented a statistical analysis comparing cloud amount, inferred from solar radiation data, with measurements of cosmic rays. Statistical tests show evidence for a small electrical effect on clouds, by detecting a weak signature characteristic of galactic cosmic rays.

The final speaker was Dr Tom O'Connor from the National University of Ireland Galway. Tom spoke on the Mace Head site and other condensation stories. His talk was a history of the Mace Head site, which celebrates 50 years this year. Mace Head, on the western coast of Ireland, has some of the cleanest air in Europe. It is one of the main global atmospheric monitoring sites, and is frequently used as a background site for many European studies. Tom was one of the original staff involved with the acquisition of the Mace Head site, and he presented some excellent photographs of events held there, and quite literally a who’s who of atmospheric condensation through the past 50 years. If you missed this fascinating piece of oral history, Dr O'Connor is scheduled to repeat his lecture at the Members’ Day to be held on 14th May 2008 in London.

Pat Goodman

Forthcoming Events

Environmental Physics Group Members’ Meeting

2.15pm Wednesday 14th May: Lovelace Room, Institute of Physics

The fifth EPG Members' Meeting promises to provide an excellent opportunity for the community to get together and discuss the diversity and depth of environmental physics. The Members’ Meeting will include a variety of talks from EPG members, and the EPG essay winners will also be announced. A keynote lecture will be given by Dr Tom O'Connor. The meeting will be held in the Lovelace Room, Institute of Physics.
This year we have especially sought to encourage early career environmental physicists (students and all those who have been in employment for less than 10 years) to present research, and likewise we encourage them to attend the meeting. Travel grants are available. The meeting will also incorporate the Group’s AGM and will be followed by an evening lecture. Following the successful talk to the IOP in Dublin last year on the 50th anniversary of the Windscale nuclear reactor incident, Professor Wakeford will present his talk as the evening lecture. Further details of Professor Wakeford’s talk are advertised separately within the newsletter.

Confirmed speakers for the Members’ Meeting include:

- “The Mace Head site and other condensation stories”, Dr Tom O'Connor, National University of Ireland, Galway.
- “Trapping aerosols with light”, Dr David McGloin, University of Dundee.
- “Observing and modelling insect migration in the atmospheric boundary layer”, Dr Curtis Wood, Reading University.
- “Desert Challenges: Towards better prediction of gaseous fluxes from Kalahari soils”, Dr Stephen R Hoon & Dr A D Thomas, Manchester Metropolitan University.

The Members’ Meeting commences at 2.15pm, with Professor Wakeford’s evening lecture at 6.30pm. The programme is being finalised - please look on the EPG website, www.iop.org/activity/groups/subject/env/ under ‘Forthcoming events’ for updated information.

There will be no charge to group members attending the meeting. Non-members will also be very welcome to attend (limited number of places available) subject to a registration fee of £10. The EPG will be allocating a number of travel grants for this meeting to assist with travel costs (apply to Peter Hodgson, at the address below).

If you intend to come to the meeting, please return the form on the next page to: Dr. Peter Hodgson, Corus RD&T, Swinden Technology Centre, Moorgate, Rotherham, S60 3AR or send an email with same details to: Peter.Hodgson@corusgroup.com to assist with catering requirements.
The Windscale nuclear reactor accident - 50 years of investigations

Prof Richard Wakeford, University of Manchester
6.30pm Wednesday 14th May: Franklin Room, Institute of Physics

Although it happened half a century ago, the nuclear reactor fire during October 1957 at Windscale Works, Sellafield, England, remains the largest accidental release of radioactive material into the environment that has occurred in the West. Extensive investigations into the causes and consequences of the Windscale accident have been carried out over the past fifty years, including a recent re-evaluation of the quantities of radionuclides released to atmosphere and their subsequent travels over northern Europe. The presentation will provide a background to the accident, what happened during the fire, the environmental monitoring that took place, and our current understanding of the aerial emissions and the movement of the plume, including the recent work on this subject.

A further introduction to the Windscale disaster was presented in our November 2007 newsletter, and this can be found online at: http://www.iop.org/activity/groups/subject/env/Newsletter/file_26811.pdf

This talk will follow the Environmental Physics Group AGM (see separate notice in this Newsletter), to which members are warmly invited. If you intend to come to the meeting, please return the Members’ Day form to: Dr. Peter Hodgson, Corus RD&T, Swinden Technology Centre, Moorgate, Rotherham, S60 3AR or send an email with same details to: Peter.Hodgson@corusgroup.com, in order to assist with catering requirements.

I intend to come to the Environmental Physics Group Members' Meeting and/or evening lecture at the Institute of Physics, Wednesday 14th May 2008.

□ Members’ Meeting  □ Evening lecture  □ Both  (please tick)

Name: ________________________________________________________________

Address: ________________________________________________________________

______________________________________________________________________

Tel.: ____________________________

Email: ____________________________
Sustainable Energy: new solutions from Physics and Engineering

The Institute of Physics, London. 29th October 2008: Franklin Theatre

Organised by the Applied Physics and Technology Division

Many meetings on sustainable energy are organised simply to outline the problems faced by mankind in changing our approach to energy production and conservation so that carbon emission is reduced. This meeting aims to offer a more practical approach where new scientific ventures are beginning to give some solutions to those problems. The meeting is aimed at university and industrial scientists and engineers working in the sustainable energy field. Sustainable energy is one of the main areas identified by research councils for support and the meeting will give an opportunity for academics and industrialists to seek new collaborations for fundamental and applied research in this area. For this reason, speakers will all give a non-specialist level overview of their work and outline areas where further work is urgently required. A long luncheon break, a poster display and short 5 minute talks by representatives from energy-based companies will be included in the day’s events.

Provisional Programme

0945 Registration and Coffee
1015 Introduction
1020 Wind turbine blades: design and performance
    Ole Thomsen (Denmark)
1045 Digital displacement and its application to the delivery of energy from
    wave-power
    Jamie Taylor (Edinburgh)
1110 Energy-efficient Glazing Design
    John Ridealgh (Pilkingtons)
1135 Short Contributions

1230 LUNCH, NETWORKING POSTERS

1400 Energy-efficient Buildings
    TBC
1425 Fuel Cells
    Vladimir Vishnyakov
    (MMU)
1450 The contribution of low friction coatings to energy efficiency
    Mark Gee (NPL)
1515  TEA
1545  Materials challenges for the next generation of photovoltaic solar energy
       Modules
       Stuart Irvine (Bangor)
1610  TBC
1635  Tea break
1700  Plenary lecture (open to all)
       Professor Steven Cowley (UCLA and Imperial College)
       Title relating to Fusion,TBC
1800  Close of meeting

Prof John Colligon
Department of Chemistry and Materials
Manchester Metropolitan University
Chester Street
Manchester
M1 5GD

Tel: (0161)-247 1452
Fax: (0161)-247 1438
email: J.Colligon@mmu.ac.uk
## EPG Committee

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Contact Details</th>
</tr>
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<tbody>
<tr>
<td>Chair</td>
<td>Dr. Peter Hodgson</td>
<td>Environment Department, Corus RD&amp;T, Swindon Technology Centre, Rotherham S60 3AR Tel: 01709 825478, Fax: 01709 825400 e-mail: <a href="mailto:peter.hodgson@corusgroup.com">peter.hodgson@corusgroup.com</a></td>
</tr>
<tr>
<td>Vice-Chair</td>
<td>Dr. R. Giles Harrison</td>
<td>Dept. of Meteorology, University of Reading, PO Box 243, Earley Gate, Reading, RG6 6BB. Tel: 01189 316690, Fax: 0118 378 8316 e-mail: <a href="mailto:r.g.harrison@reading.ac.uk">r.g.harrison@reading.ac.uk</a></td>
</tr>
<tr>
<td>Hon. Secretary</td>
<td>Dr. Pat Goodman</td>
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