

London's Defence: The Thames Barrier



A recent EPG trip where members learnt why the defence was needed, how it works and how the capital will be protected against flooding in the future.

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Welcome to the Spring edition of the EPG newsletter

Over the last few months members have been invited to several events – a visit to the Thames Barrier and a talk on atmospheric research from radiosonde balloons in December (reports on page 7 and page 8), and a joint event with the RMetS on biosphere/atmosphere interactions in January (page 9), followed in February by an evening lecture jointly hosted by the South Central branch on climate change and old naval records (page 11). The Scots also had a taste of environmental physics as group treasurer Mhairi Coyle organised some public engagements activities in Penicuik (page 12)

In May we are holding our annual Environmental Physics Day. This is a great opportunity for members to present their research in environmental physics, so if you are interested in learning more or even present, go to page 14. The event incorporates our essay prize winners, Annual General Meeting and evening lecture (page 15). Further to our annual members day event we have numerous events organised throughout the year, including the conference on Mathematical Geophysics, jointly sponsored by the IOP Environmental Physics Group and the Nonlinear and Complex Physics Group to be held in Edinburgh at the end of June (see page 16).

We welcome new members to the group and committee, and the Members' Day is a great opportunity to find out more. With changes to the IOP regulations of length of service on a committee, there are several spaces for committee members and we very much welcome volunteers. The EPG continues to hold successful events with other societies and organisations. If you have an idea for an event, as a stand-alone activity or with another society, please let one of the group officers know.

We hope you enjoy the newsletter.



Sally Brown and Hugh Mortimer

EPG News

A message from Pat Goodman, Chair of the EPG

Dear Colleagues,

As our Members day and AGM approach, its hard to believe that another year has gone by so quickly. The past year has been a very busy year for the Environmental Physics Group, and you will find details of all the events we have held in this and in the previous newsletters. While speaking of newsletters I would like to thank Sally Brown and Hugh Mortimer for all their hard work in producing these excellent newsletters, the EPG newsletters are recognized within IOP as setting a standard for other groups.



You will also see in this newsletter details of events we are planning for later in this calendar year, and of course our members day on the 30th May. I hope that as many of you will be able to attend and to actively participate in the event, perhaps by submitting a talk, or a poster.

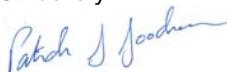
In previous newsletters I noted some difficulties we were having in regard to IOP rules on committee membership and the length of time one is allowed serve on a group committee. We have had some success in this regard, and the IOP rules have been changed. However we are still having difficulties as we are losing some key people from our committee, I would like to thank Prof. Giles Harrison for all his contributions over the past number of years, Giles will be sorely missed from our committee meetings, but thankfully he has agreed to help the EPG where possible, and I hope that we will see him on the committee again in the future. We are also losing our Honorary secretary Dr Paul Williams, without Paul's support and organizational skills I would not have survived the past two years as chairperson. I personally want to thank Paul and Giles for their enormous contributions to the EPG and wish them well, and hope that we see them on the committee again in the future.

The role of subject groups in the IOP is to provide subject relevant services to their members, so in the EPG we have tried to work closely with other groups and with branches to run events that we hope you our members want and appreciate. It is not always possible for us to cover all topics and subjects, and often the mix of topics we present reflect the diversity and mix of interests and contacts that the committee members have, so I would encourage you to consider getting more involved with EPG, and certainly please tell us if we are doing things wrong.

I want to thank all the committee members for all their hard work on your behalf over the past year.

I hope to see as many of you as possible at our members day on the 30th May.

Sincerely



Pat Goodman
Chair EPG

Correction to the November 2011 edition of the EPG newsletter Reports of previous events - Environmental Physics Day

In our November 2011 we incorrectly listed Mrs Anne Silk as Dr Anne Silk. We would like state that Anne is not a doctor, and this article was not meant to misrepresent Anne in any way. We apologise to Mrs Silk for the mistake, and any misrepresentation that this may have caused. A corrected version of the newsletter has been published on the IOP website.

Reports from EPG Previous Events

Visit to the Thames Barrier Woolwich, Central London Wednesday 14th December 2011.

What does a gas tap and the River Thames have in common? Not an obvious answer you may think, but the answer is the Thames Barrier, a flood protection scheme which reduces flood risk in London.

On Wednesday 14th December 2011, 40 members of the Environmental Physics Group, the Retired Members Group and London and South East and South Central Branches journeyed to Woolwich to learn about why a barrier was needed to protect one of Europe's largest coastal cities, how the Thames Barrier was built, its workings, what its future is and what this means for the people of London. After a lunch with delightful views over the Thames and the barrier, members listened to a talk given by a representative from the Environment Agency. Nick, our guide was an encyclopaedia of information about the barrier and keenly responded to all questions asked.



For those old enough to remember the devastating 1953 East coast floods which killed 300 people in the UK and many more in the Netherlands, this catastrophe was a turning point in how the capital was defended. Politicians and engineers asked themselves that with such damage occurring from a 1953 flood in a largely rural area, what would happen if another large storm occurred, but this time in the Thames Estuary? The answer

was clear – millions of pounds of assets and infrastructure would be damaged, flooding of historic buildings, thousands of people potentially losing their homes and a clear-up operation and disruption that would last for months. The solution? A revolutionary method of protection: rather than building higher river walls, a 550m moveable barrier would be constructed to stop the tide coming from the North Sea up the Estuary towards the city.

Given Royal Assent in 1972, the barrier cost £535 million to build (£1,400 million in 2007 prices), took eight years to construct, and was first used in February 1983. The barrier comprises six rising sector gates, which when not in use rest on the sea bed, meaning that boats can navigate through when the barrier is not in use. Four of the six steel gates are placed 61m apart, with the remaining two smaller gates 31.5m apart. The distance apart of the larger navigable gates is no accident – they are exactly the same width as the distance between the towers of Tower Bridge, so that boats of equal size can navigate upstream. Engineers uniquely designed the rising gates – and here is the interesting link – as they resemble a gas tap. When the gates are lowered (shaped like a D turned 90° clockwise) water can flow over the defence, but as the barrier is slowly rotated up, lower volumes of water (equivalent to gas) can flow through, until no water can flow through when the D-shaped barrier is upright again. This clever piece of engineering means that the barriers can be quickly put to work even during routine maintenance periods.

It takes 90 staff members to maintain and run the Thames Barrier, and forecasting of extreme weather conditions causing a surge can be given up to 36 hours in advance. Each gate needs to be closed one-by-one otherwise it can cause a reflective wave up the Estuary towards the city, which can potentially cause damage to infrastructure. When this theory was tested the wave was large enough for the gangway(steps) to fall from HMS Belfast which is docked near Tower Bridge! Since its first closure in 1983, the barrier has



been closed over 100 times, and now also helps protect from river flooding due to precipitation, rather than that of a rising surge tide. In the future, the barrier is expected to rise more often than sea levels are rising, with rises of up to 2m potentially expected (although unlikely) over the next 100 years. Whilst the barrier can cope with some rise in sea level, it is limited. Initially designed until 2030, it is believed the barrier can now continue until the second half of the 21st century, depending on how fast sea levels rise. By this time alternative methods of adaptation are required, and one suggestion is to remove walls allowing the sea to flood land which is of lower value further down the estuary. This process of managed realignment – although in places it is controversial - is already being successfully undertaken. The information learnt about the Thames Barrier gave us a very enjoyable visit. A tour of the exhibition centre concluded the day which everyone agreed had been very interesting and informative.

So next time you hear of storms down the east coast and rising sea levels, or even turn on a gas tap, have a thought for the engineers who designed and built the Thames Barrier, and the scientists – including – environmental physicists – who help predict when and where extreme water levels will occur and how they will change in the future.

Atmospheric research from balloon – “Research Radiosondes”

Dr Keri Nicholl, University of Reading.

Reading, Berkshire

Wednesday 14th December 2011.

Run jointly with the Royal Meteorological Society SE Branch, Reading, December 2011)

In this meeting, held jointly with the Royal Meteorological Society at Reading Town Hall, Dr Keri Nicoll of the Department of Meteorology, University of Reading spoke on the variety of uses of meteorological balloons for atmospheric measurements. She began by describing the history of sounding methods for the atmosphere, up until the first radiosonde, launched in France by Robert Bureau in 1929, which was closely followed by Molchanov’s operational ascent in 1930, which relayed the data back to the forecasting centre in Moscow. (Idrac and Bureau also obtained signals from transmitters in the stratosphere, in 1927.) These early “radiometeorograph” devices used mechanical methods to encrypt the measurements made, which were then sent over a short-wave radio link. As pioneering technologies, they marked a fundamental change in atmospheric measurements, as they returned above-surface observations in real time.



Although radiosondes are used widely in modern meteorology, with, for example, many flights made daily from multiple sites in the UK, the measurements made are usually only those of temperature, pressure and relative humidity, together with wind vectors derived from tracking the radiosonde's position. Dr Nicoll explained that radiosondes have also been used for a range of research purposes as well, such as monitoring ozone and radioactivity and the electrical structure of clouds. For this they carry additional sensors, with the information obtained also sent over the radio telemetry employed. Earlier radiosonde technologies used analogue approaches to return the data, such as variable frequency tones, but digital methods are becoming increasingly widespread, with the usual advantages that more measurements can be exchanged, stored and retrieved.

Dr Nicoll's own work concerns the wider use of research radiosondes, such as for measuring charge on Saharan dust and the charge present on the edges of non-thunderstorm clouds. For this a measurement system has been specially developed at Reading, which allows the simple addition of extra sensors to standard radiosondes. From flights employing this methodology, she showed examples of the charge measured at the top and beneath layer clouds, and also during the two Icelandic volcano emergencies in which radiosonde systems provided information about the spread of the ash plume over the UK.

There was keen interest in this talk from the audience, and there were many questions. It stimulated reminiscences from those who had worked with radiosondes over many years, including James Milford, whose Oxford DPhil thesis in the 1960s supervised by Alan Brewer concerned developing the ozone sonde. Both James Milford and Lewis Simmonds, former students of Brewer who had not met in many decades, brought radiosonde instrumentation artefacts with them.

References

Keri Nicoll *Weather and Climate Discussion blog*:

<http://www.met.reading.ac.uk/Data/CurrentWeather/wcd/blog/research-radiosondes/>

K.Nicoll and G. Harrison, Rising to the Challenge: Research radiosonde high-altitude systems *Meteorological Technology International*, November 2010, 140-143

R.G. Harrison, K.A. Nicoll and A.G. Lomas, Programmable data acquisition system for research measurements from meteorological radiosondes *Rev Sci Instrum* **83**, 036106 (2012) doi: 10.1063/1.3697717

Atmosphere-biosphere interactions

Imperial College, London

Wednesday 13th January 2012

Run jointly with the Royal Meteorological Society

Energy, water, carbon and other trace gases are constantly exchanged between the biosphere and the atmosphere with interactions and feedbacks on local, regional and global scales and relevance for both weather and climate change. The Royal Meteorological Society held a meeting in association with the Institute of Physics on 18th January 2012 on the topic of land biosphere-atmosphere interactions to discuss latest research and challenges for the future. About 40 people attended the event, with five speakers covering different aspects of the topic from the perspectives of observations, understanding interaction processes and large scale modelling for weather forecasting and climate prediction.



Dr Gianpaolo Balsamo presented on behalf of Dr Roselyne Lacaze on the topic of global earth observations for land surface. The frequent monitoring of our environment is crucial to provide decision makers with accurate, up-to-date and reliable information on the changing conditions of our planet. The talk described the European Union GMES land monitoring service with a wide range of applications such as the monitoring of forests, of water and natural resources, agriculture, and food availability in developing countries. The GMES program is also providing observations to help analyse the terrestrial carbon cycle and contribute to a better understanding of climate change.

Global and regional surface carbon and water balances affect the weather, the climate and several associated phenomena such as river flows, forest and crop growth and carbon sequestration. Dr Eleanor Blyth described how both carbon and water in land biosphere-atmosphere interactions are linked through the millimetre sized openings in the leaves of the vegetation: the stoma. There are several theories about what controls the stomatal opening in vegetation and these theories have been incorporated into global climate models, simulating the dual role of the land surface of carbon absorption/emission and water stores/losses. Dr Blyth described the use of site-based observations at sub-diurnal timescales simultaneously measuring fluxes of carbon dioxide and evaporation to challenge some of these theories.

Prof. Emanuel Gloor discussed the potentially important role of the Amazon rainforests for the global carbon cycle and climate because they host a large amount of carbon, which may be released to the atmosphere on a short time-

scale. A main driver of such changes is the fast development of the countries that share the Amazon basin with significant deforestation. Changes in the atmospheric environment and drought caused by increased climate variation may potentially also play a role by mediating vegetation changes, with some models predicting a switch from forests to savanna. A forest census network performed over the last 20 years for 150 plots suggests the forest biomass is increasing, but this needs to be placed in the context of the intermittent forest disturbance (tree uprooting due to strong wind events). There is also the suggestion that precipitation patterns are changing over the Amazon with a trend to higher precipitation, but also stronger seasonality, although it is not yet clear how this will impact on the forest in the longer term.

The last two talks turned to the importance of including carbon land-atmosphere interactions in atmospheric models for weather and climate prediction. The vegetation layer, via its impact on radiation, winds, rainfall interception and transpiration, plays an important role on the surface-atmosphere exchanges, and therefore an accurate representation of the processes driven by vegetation is essential for Earth System Modelling. Dr Souhail Boussetta showed how the improvement of the vegetation representation in the ECMWF global model can affect weather-prediction through leaf area index, albedo and evapotranspiration, and reciprocally how weather-prediction can impact on the estimation of carbon dioxide transfer between atmosphere and biosphere.

Finally, Dr Andrew Wiltshire talked about land biosphere-atmosphere interactions in terms of Earth System Modelling for climate change and impacts. The Hadley Centre Global Environmental Model version 2 (HadGEM2) has been designed for the specific purpose of simulating and understanding the centennial scale evolution of climate including biogeochemical feedbacks. This earth system model is used to assess the impacts of climate change and Dr Wiltshire described results from the HadGEM2 climate model simulations for the IPCC Fifth Assessment from an impacts perspective, specifically; ecosystems and water resources. Given increasing atmospheric CO₂, crops and vegetation were more productive, but this needs to be placed in context with potentially increased demands for water resources. Regionally, both increases and decreases in productivity and water resources are predicted across the globe, but there remains many uncertainties, particularly in the representation of the carbon cycle. Earlier talks highlighted some of the research that is ongoing with a wide range of observations, process studies and modelling to improve our understanding of land biosphere-atmosphere interactions and help to reduce these uncertainties for Earth System Modelling, climate change and its associated impacts.

For further information on the meeting, see the Royal Meteorological Society web site <http://www.rmets.org/events/detail.php?ID=4656>

Sailors, sea-dogs and storms: how old naval documents help us to understand climatic change.

Dr Dennis Wheeler, University of Sunderland

National Oceanography Centre (NOC), Southampton

Organised by the Environmental Physics Group, South Central Branch and Tyndall Centre for Climate Change Research at Southampton.

Thursday 23rd February 2012



HMS Surprise

When the Navy logged their daily weather on ships three hundred years ago, little did they know that they would be helping 21st century science. This fascinating talk given by Dr Dennis Wheeler, University of Sunderland explained what Navy log books are available, their usage, the type of weather documented, and how this is helping us understand past and future weather conditions.

Many researchers would love to have sufficient data – particularly of past events, to understand science. With ships' logs this is certainly not a problem! There are around 120,000 books and 22 million days of observations from numerous ships world-wide, so Dr Wheeler and his colleagues are inundated with data. Like global airplane route maps we see today, ships and their log books also had common routes – such as across the Atlantic Ocean. Conversely more difficult and less needed journeys contain few routes (e.g. the Pacific Ocean and at high latitudes), and therefore records of weather at sea are limited in these areas.

The Navy records wind force, wind direction and a general description of the weather conditions. Now you may think that understanding past weather conditions from log books is an easy business, but think again. Whilst the Navy was generally taught to learn about the weather on ships and had a set range of words to describe the weather (many of which we still know today), there are in fact many log books that have much more of an extensive vocabulary that we use little in English today. Weather words to describe wind include: fine, small, light, fresh, easy, gentle, brave, indifferent, soft and pleasant. Looking back at dictionaries of the day, researchers have been able to understand what these words meant and translate them into the Beaufort scale.

Apart from understanding the type of weather, researchers have had to understand the ships position. Log books of 20th century ships have refined methods of navigation and of recording their position on a global scale, but earlier voyages often used a local meridian (e.g. the port they were leaving) and all latitudes and longitudes were taken relative from there. For the researchers, establishing the correct datum was important as otherwise weather may be recorded in the wrong place. At times, it was clear a positional error had occurred

as a ship's position was recorded as being in the middle of the Sahara desert! A further challenge was establishing dates and times as different calendars were used around the world, and these changed over time.

The data collected is an invaluable source of information to understand how the climate has changed. CLIWOC (Climatological Database of the World's Oceans 1750 – 1850 <http://www.ucm.es/info/cliwoc/>) was an EU funded project from 2001 to 2003 which electronically documented the content of log books to assess climate. Once the data was documented, Navy records were compared with other data. For example, when log books noted that there were more storms northwards, this could be compared with other land based data and then the increase in storms to the north could be attributed to a northward movement of the jet stream. Log book records are also being used to help understand future climate. For instance, log books are compared with hindcast data from climate models. Apart from helping validate the models, it can also provide missing data. Further research projects are being undertaken.

Dennis demonstrated his passion and enthusiasm for the subject, which was shared with around 65 audience members from the Institute of Physics, University of Southampton and others. The talk's popularity demonstrated the multi-disciplinary nature of physics based research, linked the British interest and fascination with the sea, the British Navy and the many millions of log book records it has produced.

National Science and Engineering Week: Penicuik, Scotland.

Organised by CEH Edinburgh

Penicuik, Scotland

Saturday 10th and 17th March 2012

As part of National Science and Engineering Week, CEH Edinburgh (www.ceh.ac.uk) arranged events for the public on the theme "pollution in motion" and in particular the effects of reactive Nitrogen on ecosystems.

On Saturday 10th March there was an open day at the town hall with several stalls and activities, including physics. Mhairi Coyle (EPG member) who works on measuring the land-atmosphere exchange of various gases and aerosols described how we use sound to measure the environment, in particular windspeed. Some simple demonstrations on sound were included like the clanging coat-hanger (see the 'Marvin & Milo' cartoon

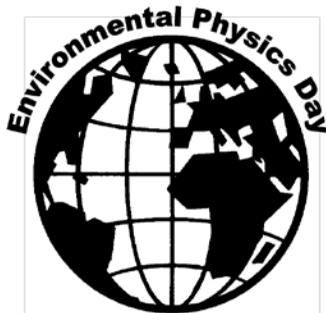


Mhairi demonstrating clouds in bottles

Forthcoming Environmental Physics Group Events

Members' Day 2012

IOP London: Wednesday 30th May 2012 13.00 for lunch, with a 13.45 start.



Building on the success of previous events, the Environmental Physics Group is pleased to announce that the annual **Environmental Physics Day** will take place on Wednesday 30th May 2012. The day will see a mix of presentations from environmental physicists from a variety of disciplines (such as geographers, mathematicians and meteorologists) including the EPG essay winners. The day also incorporates the **AGM**, and concludes with an evening talk by **Dr Arnaud**

Czaja with the London and South East branch in the evening (see 15 for further details). It is a relaxed and friendly event to discuss environmental physics and find out more about the group and its members. **We invite members of the EPG to present their research in poster and oral forms—this is your chance to get involved.**

We welcome presentations (both poster and oral)—poster / talk 'recycling' from previous meetings is fine. If you haven't presented before it doesn't matter as long as you have the enthusiasm to share your research interests with others. If you are an undergraduate, please don't be shy — please come along on the day to see what other environmental physicists are doing.

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. Further details will be sent later, and will be posted on the EPG website at:

<http://www.iop.org/activity/groups/subject/env/calendar/index.html>

If you would like to present your work or research, contact Chris Lavers (brnc-radarcomms1@nrta.mod.uk), for full details, see the back of the newsletter) by **Wednesday 25th April 2012**. Please state the topic/title of the research, your contact/affiliations details, and whether you are a student.

If you would like to attend Environmental Physics Day, to assist with catering, please could you fill out the form below by **Sunday 13th May** and send to: Dr Chris Lavers, Plymouth University at Britannia Royal Naval College, Dartmouth, Devon, TQ6 OHJ or send an email with the same details to: brnc-radarcomms1@nrta.mod.uk

Reply form for Environmental Physics Day – please respond to Chris Lavers by **Sunday 13th May**. If you would like to attend to evening lecture which concludes Environmental Physics Day, please reply directly to the London and South East Branch (londonsoutheast@physics.org)

I would like to attend Environmental Physics Day and the AGM from 1pm.

Name: _____

Address: _____

Tel/email: _____

Members' Day 2012: Evening lecture – ‘A consideration of the forcing of climate change using simple physics’.

Dr Arnaud Czaja, Imperial College, London.

IOP London

6.30pm start, followed by refreshments. Wednesday 30th May 2012.

Run jointly with the London and South East Branch.



Following on from our Members' meeting and AGM, Dr Arnaud Czaja will present some of his research based at Imperial College, London.

Discussions about the influence of human activities on climate usually either focus on projections of climate change based on complex climate models, or on instrumental records and reconstruction of past climates from proxy data (e.g. gases trapped in ice cores, tree rings, etc). This situation is somewhat unfortunate because it might then seem that anthropogenic forcing of climate is a topic that can only be understood by climate modellers, experts in the interpretation of proxy data, and statisticians who have the tools to analyze climatic time series.

In this talk, building upon a recent Discussion Paper published by the Grantham Institute at Imperial College London, Dr Czaja will take a very different perspective on the matter. The essential idea is that, instead of just debating climate model projections or time series analysis, it is useful also to reflect on the *magnitude* of the forcing of climate change due to human activities - a forcing which is well understood and solidly rooted in physics. To do so, Arnaud will provide simple “back-of-the-envelope” calculations to put the relevant numbers into perspective, with a particular focus on the role played by the ocean circulation.

To register please send an email to londonsoutheast@physics.org by 28th May.

29th IUGG Conference on Mathematical Geophysics
National Museum of Scotland, Edinburgh
Monday 18th – Friday 22nd June 2012



This conference is jointly sponsored by the IOP Environmental Physics Group and the Nonlinear and Complex Physics Group.

The conference sessions include:

- **Mathematics of planet Earth** (Convener: Mary Lou Zeeman)
- **Earth observation** (Convener: Andrew Curtis)
- **Earth system dynamics** (Convener: Antonello Provenzale)
- **Crustal dynamics** (Convener: Yehuda Ben-Zion)
- **Mechanisms of Atmospheric-climate variability and change** (Convener: Brian Mapes)
- **Ocean processes: from small scale to global circulation** (Convener: Henk Dijkstra)
- **Rationalising models with observations** (Convener: Ian Main)
- **Solving Geophysical Problems** (Convener: Roel Snieder)

Invited speakers include:

- **Walter Munk** (Scripps)
- **Tom Jordan** (Southern California Earthquake Center)
- **Carsten Eden** (University of Hamburg)
- **Prashant Sardeshmukh** (CIRES Climate Diagnostics Center, Colorado / NOAA)
- **Roel Snieder** (Colorado School of Mines)
- **Chris Jones** (University of North Carolina)
- **Malcolm Sambridge** (ANU)
- **Michel Campillo** (Grenoble)
- **Finn Lindgren** (Centre for Mathematical Sciences, Sweden)
- **Felix Ng** (University of Sheffield)

For more information, see the conference website:

<http://www.cmgedinburgh2012.org.uk/>

Forthcoming IOP Events

Photon12

University of Durham

Monday 3rd – Thursday 6th September 2012

Photon12 is the largest optics conference in the UK. Photon12 will comprise:

- Optics and Photonics 2012 the biennial conference of the IOP Optics and Photonics Division. The conference includes sessions representing the Groups of the Division, and from the Fringe Analysis Special Interest Group.
- QEP-20 the latest in the series of conferences initiated in 1973 by the IOP Quantum Electronics and Photonics Group.
- An Industry Technology Programme: sessions of particular interest to those in the optics industry.
- An exhibition of the latest optics and photonics technology
- Plenary Lectures
- Tutorials and summer schools



The call for abstracts has now closed.

Early registration deadline: 27th July 2012

Registration deadline: 29th August 2012

A limited number of student bursaries are available provided by the Rank Prize fund (see <http://www.photon.org.uk/101502>). More information and updates about the conference can be found: <http://www.photon.org.uk>

International Conference on Neutron Scattering

Edinburgh International Conference Centre

Monday 8th – Friday 12th July 2013

ICNS 2013 will bring together scientists from a wide range of disciplines including biology, chemistry, earth science, engineering, materials science and physics. This international conference is held every four years, and abstracts are not due until 15th February 2013, so plenty of time to get your thinking caps on!



Energy and Low Carbon Technology Conference - Measurement Makes Business Sense

Central London

18th – 19th September 2013

Jointly run by the IOP, this programme comprises 5 parallel streams, plus plenary sessions covering research and development, advances in technology and instrumentation, applied measurement and metrology, measurement infrastructure and training.

For more information, see the conference website:

[http://www.tuvnel.com/tuvnel/energy and low carbon technology conference](http://www.tuvnel.com/tuvnel/energy_and_low_carbon_technology_conference)

Other Activities

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?

Workshops are being held in Belfast, London, Cardiff, Sheffield, Oxford, Cumbria, Cambridge, Manchester, Newcastle, Derby, Edinburgh and Inverness between now and November. 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*

If you are interested in attending one of these workshops, please email CPD@iop.org along with your membership number.

Work placement scheme launches

A new Institute internship scheme launched in January.

Forty bursaries of £2000 are being offered to penultimate-year undergraduate student members of IOP who have secured work placements of up to eight weeks in length, in an area related to physics-based business and innovation, to take place during the summer holidays.

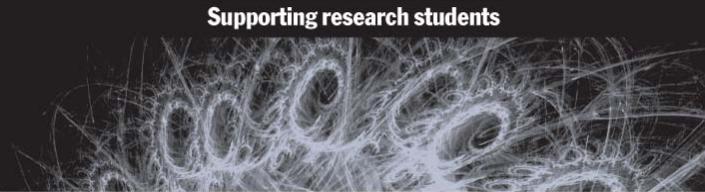


Further information about the application process and possible companies are available at <http://www.iop.org/careers/top40/index.html>

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.

Supporting research students



Research Student Conference Fund

Providing financial support to research student members, to attend international conferences and major national meetings.

Apply for up to £250 during the course of your PhD.

Applications are considered on a quarterly basis and should reach the Institute by: 1 March, 1 June, 1 September or 1 December

For further information see www.iop.org or contact supportandgrants@iop.org

IOP Institute of Physics

EPG Committee

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