The Physics of Flight.

The physics of flight explored in a meeting about the animal world.

http://www.iop.org/activity/groups/subject/env/
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EPG Committee 20
Happy New Year and welcome to another addition of the Environmental Physics Group’s newsletter. We all hope that you have had a great festive period, and what better way to celebrate another year than a roundup of all the meetings, talks and events that have taken place and take a brief look at those still to come in the following months.

The action packed newsletter this month includes a personal message from the IOP president, Marshall Stoneham, regarding the Institute’s campaign to raise funds to promote science in Africa (page 19). This is a very worthwhile cause and it would be great if Environmental Physics Groups members could rise to the challenge and show their support.

The final item that we wish to draw your attention to is the Environmental Physics Group survey (page 5). The aim of this is to better understand the diversity of the group which will help in planning future events. The survey takes less than 2 minutes to fill in, and so we strongly urge you to complete this.

Sally Brown and Hugh Mortimer
EPG News

Message from Pat Goodman, the chair of the EPG.

Dear Environmental Physics Group members.

Happy new year to all of our members and hoping that you all have a very successful year. On the EPG front we have a significant number of events planned, and I wish to thank the committee for all their hard work in this regard; you will find details of all our planned events contained within this newsletter.

In particular I would like to draw your attention to two particular events, one on the **16th March in Edinburgh** which we are holding jointly with the Royal Met Soc, and with the IOP Scottish Branch (see page 10). The day includes two meetings. The first a series of talks on the earth’s radiation balance, and the second, an evening lecture on the challenges of predicting the weather by Professor Paul Hardaker.

The other event is **Environmental Physics Day on 25th May** (see page 12). This is where we encourage and give members the opportunity to present some of their work. For students, travel bursaries are available – take a look at the advert on page 18 – you are most welcome to apply. We will also be holding our AGM that day, and I encourage as many of you as possible to attend and to participate in the EPG. To help us provide a better service to you our members we will be conducting an [online survey](#). Again I would encourage members to please take a few minutes to answer the survey. If you are interested in becoming more involved with the EPG please feel free to contact me or any other member of the committee.

Finally I would like to thank Sally Brown and Hugh Mortimer for all their hard work in producing the newsletter. The last newsletter in 2010 was the largest and most impressive newsletter produced by the EPG in its 20 year history, so thank you Sally and Hugh for the excellent work on that, and with this newsletter.

Sincerely,

Pat Goodman
Old copies of the EPG’s newsletters – we still need your help!

Prof Edward Youngs kindly donated his old EPG newsletters. We are still missing Number 2 in 1991. Do you have any at home? If you do, please contact Sally Brown (sb20@soton.ac.uk), who will copy and return any editions sent.

Environmental Physics Group Survey

Everybody on the EPG committee works hard to run events for you. However, we realise that members have a wide range of interests within the environmental field, and we would like to cater for as many people as possible. In order to identify members’ priorities and potential locations for future events we invite you to participate in this very short online survey. The results will help ensure our events meet members’ expectations.

The surveys takes around 2 minutes and asks questions on your area of environmental physics, your regional branch, and what topic areas you would like to see covered in future events.

http://www.kwiksurveys.com/online-survey.php?surveyID=HBIENM_862025b1

We hope that we will be able share some of the statistics from the survey in the newsletter - please be assured that no individual answers will be revealed.

The more people who answer the questionnaire, the better our overall picture will be of the nature and diversity of the group. This will really help us in planning future events. If you have any questions about this survey, please email Sally Brown: sb20@soton.ac.uk.

Thank you for your help.
Reports from EPG Previous Events

Spectral Imaging V
*The International Centre, Telford.*
*Wednesday 3rd November 2010.*

Dr Hugh Mortimer reports on a meeting that was held as part of the Photonex10 conference in Telford.

The Spectral Imaging V meeting was held as part of the conference and industry programme of the Photonex10 exhibition. The exhibition is one of the largest photonics events in the UK and as always this year’s event attracted many of the world leading industrial companies and academic researchers to the show. The Spectral Imaging meeting was co-sponsored by the Environmental Physics Group as well as the Optical Group of the Institute of Physics. The meeting was well attended and drew a turn-out of about 40 audience members, who were treated to a diverse range of presentations that covered topics from the use of hyperspectral imaging in food and agriculture through to the development of novel spectral imaging device for environmental trace gas monitoring. A big thank you must go to the organising committee and the conference conveners for making this a very enjoyable event.

Physics in the Animal World,
*Institute of Physics, London.*
*Wednesday 24th November 2010.*

Dr Chris Lavers reports on this half day meeting held at the Institute of Physics.

The meeting was introduced by the organiser, Dr Curtis Wood (Reading University) and structured to facilitate discussion of the physics behind the animal world. 18 people attended.

The first speaker Jason Chapman (Rothamstead Research) discussed orientation mechanisms of Fall Armyworm Moth

Physics in the Animal World,
high-altitude insect migration. Jason provided the audience with an overview of Rothamstead insect migration work and his research on seasonal migration, and temporal patterns. Insect migration is important because of the huge number and biomass of insect movement that can become crop pests and create disease vectors. He explained migration in terms of individual behaviour and functions in large population levels. Rothamstead has extensive data sets of nightly light trap sites (1965+) and Vertical Looking Radar (VLR) results Chilbolton (1999+) with high altitude samples taken with a 200m high balloon at Cardington, Bedfordshire, netting windborne migrants weekly over several years. Jason explained that 99% of the insects are micro-insects undetected by radar. Rothamstead also conducts computerised flight simulations by tethering insects and recording flight headings; results show that Painted Lady butterflies travel an incredible 4km in 15 minutes! Temporal patterns and biomass aerial density were investigated with VLR radar, for variable ‘swarms’ of up to 35 million large summer insects and perhaps 3.5B micro-insects in nocturnal layers with maximum abundance near 600m altitude before dawn. Findings indicate that insects fly in the warmest air where nocturnal wind jets move fastest (13ms⁻¹). If air layer temperatures are similar insects go for the fastest layer and their speed adds 4-5 ms⁻¹. Common orientation, or mutually aligned flight headings was discussed. The mechanism is something of a mystery. It was long suspected that turbulence was responsible, as visually mediated mechanisms aren’t present at night. Jason presented convincing evidence that small-scale turbulence fluctuations provide directional cues which agree with theory, predicting a clockwise direction offset error. Spring mass movements are wind controlled and observed flight behaviour gives near optimal fight trajectories. Jason contrasted insect behaviour with birds that can fly against the wind and at higher altitude. Birds rely on their airspeed to overcome winds, preferring not to wait for suitable winds in hostile environments. Moths, however, can wait for favourable airstreams, and reflects different strategies employed by warm and cold blooded animals.

Our second speaker, Graham Taylor (Oxford) presented Dynamics and Control of Eagle Flight, looking at avian flight dynamics and control. He focused on interactions of a flight eagle and its exploitation of the air. A Welsh field site was used and a 2.5kg step eagle called Cossack! Video footage revealed that Cossack’s yawing behaviour was similar to a World War 2 Spitfire, with wing morphology control revealed in high speed photography, necessary where aerodynamic breaking reduces an eagle from 42 ms⁻¹ to a stop in less than 4 seconds! Eagle flight control is excellent with no wing flapping even near highly turbulent and gusty cliff tops, a mechanism worth exploiting in small UAV platforms. Graham modelled a wing with synchronised digital SLR cameras to reconstruct wing surface topography using natural features as markers. The wing surface was fitted using multiple regression to add twist, chord and bending to an airfoil shape so aerodynamic characteristics were obtained. Eagles achieve large lift relative to drag, with gliding leading edge flap operation. Wing muscular
structures are active whilst feathers provide passive structures. Passive structures modify wing behaviour as high attack angles flip feathers out, like high lift devices on leading edge aircraft. Similar updrafts or gusts flip feathers out, making flow transition from laminar to turbulent. For flight manoeuvres inertial measurement is provided by a 0.12kg eagle flight ‘black box’, recording linear acceleration, angular velocity orientation, GPS position, and Doppler speed. Tail spread and attack angle were shown to be key factors, with negative attack angle giving downward force. Tail load predicts total bird’s load in accordance with theory. The tail supports under 5% of body weight but its load predicts 60% of the total load variation measured with accelerometers. Wings match pitch with the tail, stabilising yaw in banked turns. How birds do this without a vertical fin is a key question, as potential aircraft savings may be significant. Jason discussed modern thinking on wing tucks, starting from Wilbur Wright’s own observations, its mechanism and kinematics. The rate of wind tuck relates to flight altitude and flight time over the year as the eagle improved his flight experience and chose to fly in more turbulent areas.

After an animated tea time discussion the third talk Iridescence in animals, was provided by Professor Peter Vukusic (Exeter University). Peter gave an overview of the physics of colour in the biological world, only recently explored by electromagnetic photonics groups since the late 1980s, looking at nature for inspiration. Biological system colour is a combination of biochemical colouration: pigment, fluorescence, and bioluminescence (combining speed and control). Biological iridescence changes colour with angle, an observation noted by Newton 300 years before. Structural microscopy reveals that colour is keratin (cuticle) based, relying on periodic photonic structures which reflect specific wavelengths, and pigments. Dr Vukusic introduced photonic crystals with periodic spatial refractive index variations needed to manipulate light or colour in 1, 2 & 3 dimensions, to completely inhibit flow of particular wavelengths. Biological photonics was investigated around 1900, but it was with the SEM’s invention (1942) that Morpho butterfly scales first showed highly ordered systems. One butterfly Papilio enhances fluorescent emission so it is visible up to ¼ mile away. Peter explained that L’Oreal have marketed a cosmetics product (Lancôme), made of pigment free microstructures. He stressed that whilst manufactured structures are more ordered, natural photonics structures are still functional. 3D quasi-ordered and disordered structures were also fascinating, composed of re-orientated domains. Directional fluorescence, investigated with ‘black neon’ UV light, once again showing quasi order. Papilio’s nanostructure (a 2D photonic slab and fluorescent pigment) and a new generation high emission LEDs (Distributed Bragg Reflectors with functionality) were shown to be similar. Peter concluded his talk, emphasising bio-inspired application drivers such as photonic paint, paper security, and cosmetics.
The last talk from David Sims, (Marine Biological Association) looked at *Levy flights and predator search behaviour*. David introduced to the audience the Biological Search Problem of how to find objects at unknown locations, e.g. lost keys! What do you do to find them in the shortest time? Perhaps a local search interspersed by long jumps to consider the next likely location. Similarly hunters need to know what strategy to employ to maximise prey encounters, a problem in complex, heterogeneous environments. Key search behaviour issues were introduced, such as prey abundance distribution, predator movement patterns related to different prey densities, how prey encounters are maximised when knowledge is incomplete, and any observed general principles.

Zooplankton abundance is generally low, interspersed with abundance spikes. Basking shark hunting strategy is observed as straight tracks across low density regions until encountering regions of high density. Behaviour is modelled by a special class of random walk, or Levy flight, composed of many small steps separated by longer jumps. Some controversy surrounds the mechanism, which seems valid from zooplankton up to seals and fishing boats, in their search for new resources. Some studies are flawed due to visual representation, but there seems to be enough validating data. David’s satellite data tracks large pelagic fish movement and behaviour, providing vast data sets of temperature and light in series lasting several months, (1.2 million steps from 31 individuals for 17 species!) Scaling laws of marine predator behaviour show log/log plots for penguins and leatherback turtles (frequency Vs movement steps). David questioned whether predator and prey patterns were linked and if such patterns yield foraging benefit. Could such a model describe everything we do?

For Basking shark and other Pelagic predators vertical patterns have shown complex movements. Some patterns are consistent with Levy flight foraging hypothesis, but it isn’t universal. Experience from tracking juvenile sharks show that they don’t follow this law, but approach it from increased experience! A key question is whether Levy movements are adaptive or an emergent property. If so when did they arise and are they optimised? The answer is as yet unknown and hard to observe in laboratory environments. *To conclude Dr Curtis Wood thanked all the speakers for providing much interesting material and ensuing discussions, and for keeping to time!*
Forthcoming Environmental Physics Group Events

Clouds and the Earth's Radiation Balance – Observational Evidence.
Prof Paul Hardaker Chief Executive of the RMetS
Edinburgh City Chambers, Edinburgh
Wednesday 16th March 2011, 1:30-5:30pm and evening lecture, 6.30-7.15pm.

The science programme for this event is organised by Richard Allan and Curtis Wood, joint with the IOP Scottish Branch and the Royal Meteorological Society. Speakers include:

- Dr Richard Allan, University of Reading.
- Prof. John Harries, Imperial College and Chief Scientific Adviser for Wales.
- Dr Mark Ringer, Hadley Centre
- Dr Jonathan Shonk, University of Reading
- Dr Jim Haywood, Met Office

After a short break, Prof Paul Hardaker, Chief Executive of the RMetS will speak on ‘The challenges of predicting the weather and climate’ from 6.30pm-7.15pm.

We request that you please register through this RMetS link: http://www.rmets.org/events/detail.php?ID=4496. Further information about the meeting can be sought through Curtis Wood at Curtis@Physics.org, or see his details at the back of the newsletter. Registration is free and it is also possible to do this on the day (although advanced registration would be appreciated for logistical/catering reasons).

Further information and maps concerning all meetings is available from the Royal Meteorological Society at www.rmets.org. Non-members are welcome to attend.
Extreme Weather
Northumbria University: Ellison Building
Ross Reynolds, Reading University
Thursday 14th April 2011 at 7 pm.

Run jointly with the North East Branch, Ross’s presentation will look at the origin, nature and prediction of severe weather in both the USA and UK, focusing on tornadic storms, hurricanes and explosive depressions. These phenomena have been and are still studied intensively, offering a significant challenge to researchers and operational meteorologists alike. For further information, contact the NE Branch Secretary, Gareth Roberts (Gareth.Roberts@newcastle.ac.uk).

Aerosols and the Environment
Institute of Physics, London.
Tuesday 19th April 2011. From 10am.

This one-day meeting is organised by the Environmental Physics Group and The Aerosol Society. Invited presentations will cover a variety of areas exploring the significance of aerosol particles within environmental physics. Oral presentations include:

- Biogenic influences on marine primary and secondary particle formation - recent advances (Prof Colin O’Dowd, National University of Ireland, Galway).
- Current understanding of aerosol nucleation in the environment (Prof Ian Ford, University College London)
- Indoor Aerosols (Prof Ian Colbeck, University of Essex).
- Eyjafjallajökull volcano 2010: Volcanic ash in the atmosphere during and after the eruption (Dr Sybille von Löwis, Icelandic Met Office)
- Using aircraft measurements to determine the radiative effect of Saharan Mineral Dust (Dr Claire Ryder, University of Reading)
- Glassy aerosols and their role in ice cloud formation (Dr Ben Murray, University of Leeds)

Posters are welcome. Please contact Karen Aplin for details at k.aplin1@physics.ox.ac.uk Further information about the event can be found: http://www.iop.org/events/scientific/conferences/y/11/aero/page_45758.html
Environmental Physics Day: First Announcement & Call for Presentations

Institute of Physics, London
Wednesday 25th May 2011

Building on the success of previous events, the Environmental Physics Group (EPG) is pleased to announce that the annual Environmental Physics Day will take place on Wednesday 25th May 2011. 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 AGM and evening lecture will conclude the day. 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.** 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’.

We welcome presentations (both poster and oral)—poster / talk ‘recycling’ from other meetings is fine. If you haven’t presented before it doesn’t matter as long as you have the enthusiasm to share your interests with others. If you are an undergraduate, don’t be shy — please come along on the day to see what other environmental physicists do. There are **travel bursaries available**, and students are particularly welcome to apply for these (see page 18).

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](http://www.iop.org/activity/groups/subject/env/calendar/index.html)

If you would like to present your work, please return the form by Friday 11th March to: Dr Chris Lavers, Plymouth University at Britannia Royal Naval College, Dartmouth, Devon, TQ6 OHJ or send an email with same details to: brnc-radarcomms1@nrta.mod.uk
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 CO₂ emissions have continued to climb. This has led some to suggest more radical “Geoengineering” alternatives to conventional mitigation via reductions in CO₂ 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
Forthcoming IOP Events

13th International Conference on Electrostatics
Bangor University, Wales, UK
Sunday 10th – Thursday 14th April 2011
Organised by the IOP Electrostatics Group

The conference will bring together experts from academia, research laboratories and industry to discuss the many facets that make up the study of electrostatics.

In the preface to the proceedings of the first conference held in 1967, Dr. P. S. H. Henry, Chairman of the Static Electrification Group, wrote “Industry has been forced to study ‘static’ by its nuisance value”. The nuisance and hazards created by static electricity remain an important area of study, but today electrostatics has grown to encompass a broad range of subject areas and has many interdisciplinary associations. Bio-electrostatics, atmospheric electrostatics and environmental electrostatics cover issues that are relevant to our everyday lives and our future. Looking beyond our own world, planetary electrostatics plays an important role in the understanding of Lunar and Martian environments that will be necessary for future exploration. Electrostatics is also important in the development of new materials, processes and micro- and nano-scale engineering. Electrostatics 2011 is the perfect forum to learn about and discuss the latest advances in these and other subjects. The programme includes:

- A workshop on Sunday 10 April entitled 'Electrostatics in industry.'
- The Bill Bright Memorial Lecture by Prof. R. G. Harrison (University of Reading, UK). Fair weather atmospheric electricity
- Invited conference speakers:
  - Prof. I. Berta (Budapest University of Technology and Economics, Hungary). Lightning Protection
  - Dr. C. I. Calle (NASA, Kennedy Space Center, USA). The Electrostatic Environments of Mars and the Moon
  - Prof. A. Ramos Reyes (University of Seville, Spain). Electrohydrodynamic Pumping in Microsystems
  - Dr. A. Ohsawa (National Institute of Industrial Safety, Japan). Statistical analysis of fires and explosions attributed to static electricity over the last 50 years in Japanese industry.

Further details available at: www.electrostatics2011.org
PetroPhase 2011: 12th International Conference on Petroleum Phase Behavior and Fouling

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

This meeting offers industry and academia an opportunity to present and discuss the most recent advances relevant to both upstream and downstream. Topics 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.

**Call for abstracts**

Contributions for oral and poster presentations are invited in related topic areas. Abstracts of a maximum length of one page of A4 (or approximately 600 words) should be submitted on-line by **31 January 2011**.

- Characterisation of petroleum compounds and petroleomics, including asphaltenes, macromolecules, light ends, kerogen and bitumen
- Chemical and Physical Properties of Heavy Oils, Asphaltenes and Waxes
- Chemistry and Physics of Petroleum-Water Systems
- Flow Assurance
- Upgrading and Fouling

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

Abstract submission for this conference is now open, with a deadline of 18th March 2011. For more information, including conference themes, see: http://instituteofphysics.createsend4.com/t/r/l/ahuhuk/kltkkiihit/yd

Other Forthcoming Events

Weather Radar and Hydrology
*University of Exeter*
*Monday 18th April – Thursday 21st April 2010.*

The theme of the 2011 Symposium will place emphasis on user applications of weather radar for flood forecasting and water management. All sessions will aim to combine developments in weather radar with advances in its hydrological application. The conference aims to promote a strong interchange between researchers, practitioners in the water industry and those making advances in weather radar technology. For further information, see: www.wrah2011.org

Other Activities

Free online learning from the Institute of Physics

Do you want to further develop your managerial, business or soft skills, or work towards Chartered status? IOP online learning can help.

Check this IOP website below for information on: http://www.iop.org/membership/cpd/cpd-articles/page_44752.html

- Online learning: developing your soft skills
- Continuous professional development
- Mentoring.
- Getting chartered
Business Source® Corporate: An on-line database of business publications

An on-line database of business publications is now available to IOP members.

Business Source® Corporate offers full text articles from more than 2,700 business magazines and journals as well as country economic reports and company profiles.

For more information and direct access log onto MyIOP and follow the link from the news item or from Member Services (left hand column)

Start Talking Physics

talkphysics.org | Linking teachers of physics

Clare Thomson (Curriculum and Diversity Manager), Institute of Physics describes talkphysics, the Institute’s website for teachers of physics.

The Institute’s new community website for teachers – talkphysics.org – is up and active. It is the place to go to share ideas, get tips or simply gossip about the world of physics and physics education.

The site is structured around groups. Once you have registered, you can use the tabs on the home page to see the most recent discussions in all open groups. Or look in ‘The Hub’ to see general discussions about teaching issues focused on different age ranges. Starting a group on talkphysics would be a great way to support and encourage teachers to use environmental contexts for their physics teaching.

To follow or contribute to a discussion, follow the link on the homepage (join the group – if you haven’t already) and away you go. You can also look for older discussions using the search. For example, try searching for ‘GCSE’ to find a group talking about the new GCSEs. If you would like to get e-mail updates of discussions, then go to ‘my account’ menu at the top of the page and choose ‘my notifications’. You can also set up your own groups to share your ideas with the world (in open groups) or within your department or with others (in a closed group).

For more information: go to www.talkphysics.org to register and get started.
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. Some students have really benefited from the fund, such as Claire Neil, a student at University of Strathclyde who featured in our last newsletter (still available at myIOP). The funds helped Claire attend ‘Oceans from Space’ in Venice where she was able to present some of her PhD research. We are pleased to sponsor students at events such as these, and still have funds available. All PhD 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
IOP for Africa: a new campaign for physics education from the Institute of Physics.

Message from Marshall Stoneham, IOP President

As you know, the Institute carries out a wide range of activities to support physics research, application and education, but we would like to do more.

That is why the Institute's Council has agreed to develop a fundraising strategy, to support projects that we believe are particularly deserving and likely to have the greatest impact. I am in no doubt that the support we provide for practical physics teaching in African schools is such an initiative.

These projects have been initiated through the voluntary efforts of dedicated IOP members. Visit www.iop.org/iopforafrica to read more about how the projects work and the first-person accounts of what a difference they are making. Our downloadable information leaflet focuses on our current project in Ghana to illustrate the work that we do and the huge potential for change to physics education throughout the continent.

It costs just £25,000 to establish a new resource centre. And with an additional £20,000 the centre's reach can be greatly extended through the purchase of a "science on wheels" bus to take the team and their equipment out to schools further afield.

I am therefore asking you to join me in making a gift to the IOP for Africa fund, of whatever you can afford. Your donation will make a world of difference to teachers' lives and students' prospects. Either visit the website www.iop.org/iopforafrica, or for more information, email: international@iop.org

Thank you for your support.
## EPG Committee

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