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Welcome to issue 9.
My apologies for the late arrival of this issue of the Newsletter but I thought it best to delay for a short while so that I could include details of the proceedings from both our Congress meeting and the Group Annual General Meeting in May. I am pleased to say that both appeared successful with between 55 and 60 in the audience for the Congress meeting and about 25 at the AGM. We would have liked to have seen more members attending the AGM and if anyone has any suggestions as to how we can increase numbers at this important meeting in the EPG calendar we would appreciate hearing from you.

As well as our own meeting at the Congress this year, there was another one-day event organized by the Spectroscopy Group which had a heavy environmental physics content and so I have included a brief summary of that meeting. Anyone interested in the proceedings of that meeting should contact the officers of the Spectroscopy Group.

The EPG has been asked for comments about the impending Government review of the UK nuclear industry. There is a little more information about this in a short piece by Doug Pfeiffer in Committee News. We would like any member with an interest in these matters to pass on any comments to us as soon as they can. Time is short. We received this request only very recently and responses have to be with the EPG Committee by the middle of July at the latest.

In May, several members of the EPG Committee were interviewed by Alun Lewis, known to many as a presenter for the BBC Science Unit. The interviews will form the basis of a short radio item about the EPG and general environmental research by physicists in the UK. It is designed for distribution to overseas broadcasting authorities so it seems that it will not be transmitted in the UK. This is a pity but we will try to make transcripts available to all EPG members if we can. The Committee members interviewed were John Stewart, Geoff Hassall, Peter Hughes and Anne Wheldon.

I would also like to draw attention to a half-day visit scheduled for September. Members will tour the Meteorological Office in Bracknell and should be treated to a fascinating insight into how weather and climate predictions are formulated. Some information is included later in this Newsletter and booking forms will be circulated to members in the near future.

Finally, I have enclosed a list of names and contact addresses for current members of the EPG Committee. Group members are encouraged to send any suggestions for meetings/visits or general comments to either the officers of the EPG or to your local Committee member.

This is YOUR Group, so use it!

Geoff Hassall, Editor
Nuclear Power: Government Nuclear Review

The Government has announced the terms of reference of its Nuclear Review in a press release by the Department of Trade and Industry on the 19 May. This announcement includes an invitation for "submissions from interested parties on whether new nuclear power stations offer particular diversity, security of supply and environmental benefits or disadvantages."

The Environmental Physics Group have an interest and responsibility in the environmental aspects of this matter. Members are invited to offer their views in writing to the EPG Honorary Secretary, Alastair McCartney, ideally before the next Committee meeting (30 June), but in any case by the middle of July. These views would assist the Committee in formulating its contribution to the response of the Institute of Physics to the Nuclear Review.

Those wishing further information about the Nuclear Review should call: (071) 215-5000

Douglas Perison
Vice-Chairman, EPG

Annual General Meeting: 12 May, 1994

In an effort to increase the attendance at this year’s Annual Meeting, emphasis was placed on the lecture rather than the AGM itself which is usually a relatively quick affair lasting no more than half-an-hour. However, only around 25 members were there to hear an excellent lecture by Keith Browning of the Joint Centre for Mesoscale Meteorology (Reading University). He gave us a fascinating insight into how the predictions of General Circulation Models (GCMs) can be improved through a simple understanding of the many processes involving the flow of water and heat in our atmosphere. A general summary of his lecture was given in Research Focus in the last issue of the EPG Newsletter.

The Annual General Meeting immediately followed the lecture and began with a report from our Chairman on the activities of the EPG and its Committee during 1993/94:

Chairman’s Report for 1993/94

I am happy to report that the Environmental Physics Group continues to thrive - the membership has now grown to 465. The Committee met four times during the year. Its main activities have been arranging and reviewing meetings, and discussing the activities of the Education Sub-Committee which is chaired very successfully by Peter Hughes. The Committee also responds on behalf of the Institute of Physics to enquiries from other organisations such as the Council of Science and Technical Institutes (CSTI) and The Environmental Council.

The EPG was involved with organising 6 meetings, 4 of them jointly with other organisations, on the following topics:

- The physics of the plant environment.
- Inland and coastal water quality.
- Transport of pollutants in unsaturated soils.
- Environmental issues in physics education.
- Colonial observatories and observations.
- Physics: the solution to environmental problems.

A very exciting development has resulted from the initiative of the EPG education subcommittee who drew up an outline syllabus for a proposed A-level module in Environmental Physics and sent it to examination boards in England. As a result two examining boards – the London and the Oxford and Cambridge – have taken our proposals and these, with modifications and additions, will be presented to schools this year for examination in the summer of 1996.

To support the teachers and students taking these modules the Institute of Physics funded a working group of 12 to spend a weekend recently at Milton Keynes drawing up plans for writing the necessary material. The working group consisted of physicists working in universities, schools and research institutes – as well as Catherine Wilson of the IoP Education Division and two representatives of the examining boards. It is anticipated that the writing of this material will entail 6 to 12 months full-time effort and so to fund this work we are seeking support from upwards of 50 British companies. I hope the availability of an A-level module in Environmental Physics will increase the number of students at this level and may lead to more students taking physics at university as they realise that there is more to it than just nuclear and high energy physics.

Since environmental physics covers such a wide range of subjects, we realise that the EPG Committee cannot fully represent the Group’s interests. If anyone has any suggestions for future meetings or wishes to be co-opted on the Committee please let me know.

Finally I want to thank all the Committee members, particularly Alastair McCartney, for all their hard work.

J B Stewart

Committee Elections

There were no vacancies for new members of the Committee and the Officers of the EPG were re-elected unopposed. Members wishing to take an active role in the organisation of future EPG activities should contact the Committee Chairman or the Honorary Secretary.
News from the Education Sub-Committee

As the Education Sub-Committee beavers away, its membership has increased to include:

- Chairman: Mr Peter Hughes (Kingsway College)
- Mrs Catherine Wilson (Education Manager, IoP)
- Dr Alastair McArthur (Nottingham University)
- Dr Francisca Wheeler (Withington Girls' School)
- Dr Sally East (Atmospheric Physics Laboratory, UCL)
- Mr Michael Chapple (Middlesex University)

Members have been involved in a number of initiatives since the last Newsletter.

- The IoP Education Group's Annual Conference at Reading University (29 - 31 March, 1994) was concerned with Environmental Issues in Physics Education. Alastair McArthur was the keynote speaker. In addressing the scope of Environmental Physics he outlined the history of the subject in the UK, its breadth and its appropriateness for schools. Attention was given to the applications of Physics to environmental processes, and the use of measurement techniques in exploring these processes. Peter Hughes presented a paper on the work of the Education Sub-Committee and gave an overview of the current situation of "A" level Environmental Physics, with reference to several curriculum initiatives, including the work with the Oxford and Cambridge, and London Examination Boards.

It was a very informative and enjoyable conference, and included a visit to the Department of Meteorology in Reading.

- On the weekend of 7/8 May, 1994 the Education Sub-Committee held its first Writing Session at Milton Keynes to 'thrash out' the criteria for which writers could develop curriculum materials for the Environmental Physics 'A' level Physics programmes of the two exam boards above. The discussion group (with representatives from the EPG, the IoP 'A' level Environmental Physics Working Group and interested parties, including Barbara Hodgson of the Open University and Kate McKenzie Stuart of John Murray) consisted of school teachers, FE and HE lecturers, professional scientists and chief examiners.

It was agreed that:

1. Michael Chapple should be Editor-in-Chief.

2. The pilot materials should consist of one book for both exam boards. It is intended that this would act as an example for other exam boards who might consider incorporating Environmental Physics at a later date.
3. A timescale that envisages that materials should be completed for printing by Easter, 1995.
4. Specific areas of the curriculum were matched with writers, teacher referees and specialist evaluators, and
5. A stimulating 'house' style was adopted.

The writing of materials has begun.

- Publicity for our activities has increased. An article has been published in the IoP's "Snippets". This is distributed to all schools on the IoP's network, and there has already been several responses. Notices have also included The Globe and The Post-16 Science Issues Journal (PSSI).

- The report of the joint Environmental Physics Group and Environmental Mathematics Group (IMAA) meeting Careers and Research opportunities in Environmental Physics and Mathematics, held at UCL in April, 1992, has been published in the April/May, 1994 issue of the Bulletin of the Institute of Mathematics and its Applications. We support Professor Michael Rycroft's suggestion of cooperation and look forward to further joint activities.

Finally, preparation is underway for organizing an Environmental Physics Day at the Association for Science Education's Annual Conference at Lancaster University in January, 1995. This will consist of a morning session of speakers, followed by demonstrations and hands-on activities in the afternoon. The conference is the major science teachers' annual event and is attended by 5000-6000. We would like to hear from any of our readers if they would like to make a contribution for the afternoon session.

Peter Hughes
Chair, EPG Education Sub-Committee

Any comments, suggestions or requests for further information about the activities of the EPG Education Sub-Committee should be sent to Peter at the following address:

Kingsway College,
Sidmouth Street, London WC1H 8JB
Tel: 071 273 0544, Fax: 081 200 3421
Climate and Oceans: Mike Smithson

Like Ranjeet Sokhi (EPG Newsletter No.8) I too underwent a change in career from "pure physics" research to environmental physics. In my case, perhaps, the change in 'scale' was even greater. After more than ten years doing research in nuclear structure physics, looking at phenomena on a quantum mechanical (femtometres) scale, I moved into oceanography, in particular the study of macro-scale ocean circulation, processes on a global (thousands of kilometres) scale.

The oceans are perhaps the last great unexplored regions of the earth. The topography of the ocean floor is less well known than the surface of the moon, yet a knowledge of the processes taking place in the oceans is essential, since it is the oceans which control the earth's climate. The top two and a half metres of the oceans have as much heat capacity as the entire atmosphere and it is the transfer of energy between the surface of the oceans and atmosphere which determines our long-term climate. Global warming could drastically affect this interaction. The response of the ocean to heating is an increase in evaporation causing an increase in salinity and hence density in the surface layers. Density differences and the influence of wind forcing cause both vertical and horizontal motion, redistributing heat amongst the oceans. It is this 'conveyor belt' of heat flow that is crucial to the earth's climate.

The effect of global warming would also be to increase mean sea level. It is generally accepted that there has been a rise in global temperature of about 0.5 degrees Celsius over the last century with a corresponding rise in mean sea level of somewhere between 10 and 15 centimetres. This is thought to be due to two main processes - thermal expansion of the upper layers of the ocean and melting of glaciers at low altitudes. Prediction of future changes is complicated because the effect of greenhouse gas forcing is uncertain and the role of the polar ice caps is unclear. Nevertheless, estimates suggest a probable increase in mean global temperature of about 3 degrees with a rise in sea level of about 45 centimetres over the next 100 years. The effect of this sort of rise, in combination with the changes in weather patterns, could have disastrous consequences for many coastal areas. The return period for extreme events such as the Bay of Bengal disaster of 1970, when approximately a quarter of a million people lost their lives during a cyclone generated storm, would be much shorter. It is possible that 100-year return periods could be reduced to as little as 5 years.

It is important that we are able to predict the effects of global environmental changes on the long-term climate, but our present understanding of the problem is far from complete and our ocean-climate models are not sophisticated enough, nor is present computing power sufficient to allow us to do this. Models must be constrained by comprehensive worldwide datasets. Provision of this data is the purpose of several studies in progress at the present time. The World Ocean Circulation Experiment (WOCE), a major international collaboration, is one such study. Its aim is to understand better the behaviour of the world's major ocean currents and how they transport heat, salt and momentum around the oceans. A large part of WOCE is devoted to study of the Southern Ocean where much of the deep water of the oceans is formed and where the Antarctic Circumpolar Current (ACC) links the major ocean basins. Sea level gauges and pressure recorders on the deep ocean floor provide much invaluable information but it is only with the use of satellites that we can get the global coverage needed. The present generation of these instruments is beginning to provide information of sufficient accuracy to allow us to make realistic assessments of the changes taking place.

There is much exciting and important physics to be done and there are many uncertainties to be resolved. We cannot afford to wait until we are sure that climate change is upon us - that may be too late. When we have the ability to change our environment as never before we must know the consequences of our actions.

Mike Smithson,  
Higher Scientific Officer  
Proudman Oceanographic Laboratory,  
Bidston Observatory, Birkenhead

A note on The Globe

Members will have noted the heavy emphasis on the water and energy cycle in several of the Newsletters of late. Understanding how the Earth redistributes energy absorbed from the Sun is of paramount importance. With this knowledge our ability to accurately model and predict climate change is enhanced. From a better understanding of these processes, we can then begin to predict how well the Earth can support an ever increasing human population.

Issue 18 of The Globe (April, 1994) contains several articles under the general title: The Role of the Hydrological Cycle in Global Environmental Change. The first article is by Keith Browning in which he highlights the importance of clouds. This was the basis for his fascinating and informative lecture presented at the EPG Annual Lecture last month.

There are two other articles in this issue of The Globe. The first describes research at the NERC Institute of Hydrology on water and energy processes (supported by the Terrestrial Initiative in Global Environmental Research (TIGER) Programme). The second discusses the aims and objectives of the Global Continental Paleohydrology Project (GLOCOPH).

The Globe is produced by:  
UK GCR Office, Polaris House, North Star Avenue, Swindon SN2 1EU
The Institute of Physics
Annual Congress '94

Two one-day meetings from the Annual Congress will be featured here. The first is, of course, our own meeting, Physics: the solution to environmental problems? The second would also have been of interest to our members and was organised by the Spectroscopy Group. A brief summary of Spectroscopic Techniques in Pollution Monitoring is included at the end of Meeting Reports.

Physics: the solution to environmental problems?

This meeting was the first EPG contribution to the Annual IoP Physics Congress and it was intended to provide a positive view of the role physicists have to play in environmental research. It seems to have been a success given that it was “standing room only” for most of the day - all of the 55 or so seats available in the conference room were taken - but I hope the discomfort of those standing was offset by the diversity of topics covered by our speakers. Group Chairman John Stewart was in charge of proceedings and we begin this report with his remarks about the meeting as a whole. This is followed by a summary of the day’s proceedings.

The Chairman’s Remarks.

During the Environmental Physics symposium during the Physics Congress, speakers gave examples of the results of research by physicists which had provided the basis for solving environmental problems. Whether this knowledge will be exploited is uncertain for a number of reasons. One speaker suggested there is not much use of energy efficient equipment such as new low energy fluorescent lights because of the lack of retail outlets and high initial cost: a member of the audience commented that when he had intended to buy them he found that there were no suitable shades to fit them.

In my own presentation, I showed that in the Sahel regions of West Africa about a third of the rainfall which falls on the typical widely spaced millet crops grown in this region does not benefit the crop but is lost by evaporation from the bare soil between the rows. Since the yield of these crops is directly related to the availability of soil moisture in the rooting zone, the yield could be increased if the soil evaporation could be suppressed. The problem is then to provide a method of reducing soil evaporation which is efficient and economical using the resources available in the Sahelian region. Another speaker in discussing systems to remove particles from our streams made a plea for greater involvement of the physicist, to ensure that the most appropriate methods are developed and used.

I believe that the conclusion to be drawn from these presentations is that if physics is to be effective in providing solutions to environmental problems, then physicists need to have a closer relationship with those who use the results of our research. This means not only a change of attitude of physicists but also of the funding agencies. However, there is a real fear that if physicists become involved with the implementation of their research to solve environmental problems consequently less resources will be available for doing the necessary research. Already the funds available for this kind of work is not commensurate with the size and gravity of these problems. Historically funding agencies have been more interested in research and development than in implementation and management. A tragic example is the building of large dams and reservoirs for water supplies to irrigation schemes in third world countries. Insufficient funds have been allocated to managing the operation of these schemes including the transportation and sales of the produce so that the majority of the produce is lost and the majority of the produce is sold to the government and not the people who need it.

More action by governments, greater funding by the agencies and more involvement of physicists are required to ensure that the solutions to environmental problems proposed by physicists as a result of their research are successfully implemented.

J B Stewart, Chairman

Meeting Summary

There were seven presentations in total covering a wide variety of activities in which the physicist has a significant role to play now and in the future. It began with the first of two presentations about how energy must be used more efficiently in the modern world. In Renewable Energy: From Pure Science to Clean Living, John Twidell (De Montfort University) argued that mankind’s impact on the Earth’s ecology was now so dominant that only technology compatible with our environment must be developed and used. He proposed that Renewable Energy, with modern energy-end-use efficiency, was the only energy technology that could meet this condition. (This is a view which is consistent with current concepts of Clean Technology and Industrial Ecology which emphasize the reduction of waste and pollution through the redesign of industrial processes, increased energy efficiency and reduced use of raw materials. Ed.)

Following this view of the future of the industrialised world John Stewart (Institute of Hydrology) looked at the physicists role in the development of the third world. The Sahelian region of North Africa is a fragile ecosystem which experiences large fluctuations in rainfall from year to year and from decade to decade. In The Balance - The Hydrology of the Sahel, he described how the vegetation must cope with both inadequate rainfall and increasing exploitation due to the population pressure in the region. The physicist may not be able to solve the problem of no rainfall but, by carefully measuring the fluxes of heat and water covered over different types of natural vegetation in this region, it has been possible to enhance and improve man’s ability to predict climate variation by using physical models to aggregate data collected in the field up from the field scale to the larger scales used in GCMs. Using both GCMs and
other models it is possible to assess the effect of man's activities and hopefully lead to better governmental policies for these sensitive areas in the future.

However, a major problem in industrialised countries is that of pollution and how this affects our environment. It is of increasing concern these days and C Schofield, from AEA and Natural Environmental Technology Centre in Oxfordshire, reviewed some of the current pollution control techniques used to reduce or eliminate the release of dust from industrial plants. In Physics Applied to the Abatement of Emissions to the Atmosphere he discussed the operating principles of various pollution control devices such as bag-house and cyclone filters, and electrostatic precipitators. The next generation of these devices will have to cope with much stricter emissions limits and their development will depend on a better understanding of the physical processes governing their operation.

Over the past decade, the concern over possible climate changes due to human activity, particularly as a result of increases in greenhouse gases, has lead to many legislative moves to limit, or eliminate completely, substances which may have a harmful effect on the Earth's atmosphere. John Mitchell (Meteorological Office) described The Physics of Climate and discussed how fundamental physical principals had formed the basis for the complex three dimensional numerical climate models from which much of the evidence of possible future climate changes had been derived. It was shown how many of the predicted changes could be related to simple physical effects and examples discussed included the greenhouse effect, climate warming and drought, and the importance of clouds in determining the magnitude of climate change.

In a related presentation, Leslie Gray (Rutherford Appleton Laboratory) described some of the Physical Processes Controlling Stratospheric Ozone. Hydrodynamic effects in the atmosphere help create very cold air-pockets over the Antarctic which trap pollutants such as CFCs and other ozone-depleting substances. The concentrations of these materials is then much higher than one might normally expect and it is thought that this could be responsible for the formation of the atmospheric ozone holes observed over the southern polar regions in recent years. It is less likely that such an air pocket can form over the Arctic and so ozone depletion should be less significant.

The topic of energy usage was addressed again by Brenda Boardman (University of Oxford). In Perspectives on Energy Efficiency, she showed how the more efficient use of energy must be a major component of all policies to reduce environmental pollution. Greater efficiency allows the provision of vital energy services (such as warmth, cold food, lighting and movement) at lower cost whilst reducing the use of scarce resources. It was argued that major reductions in energy use should flow from capital investment in insulation, new equipment and appliances and it was emphasised how all those involved in the design of equipment, the provision of services, the management of organizations or household energy use will find energy efficiency of increasing importance in the future.

To end the day, our final speaker, W D Griffiths (Biotechnology Services, AEA Harwell) described some Problems Associated with Bioaerosols and their Assessment. He re-viewed the main techniques currently used to sample and detect airborne microorganisms, and examined a number of factors which can affect their survival during the sampling process.

In conclusion, the Committee would like to thank both the speakers, and the members present at the meeting, for making the day such a success. We hope the audience found the presentations enjoyable and both interesting and thought provoking. Ed.

Spectroscopic Techniques in Pollution Monitoring
Spectroscopy Group

This meeting was composed of 5 hour-long lectures describing a variety of techniques under development for the accurate measurement of atmospheric pollutants as well as some of the problems encountered when trying to measure some of the more important trace elements, pollutants, their precursors and derivatives.

The lecture titles and speakers were as follows:

- Ground Based Spectroscopic Techniques for Atmospheric Monitoring
  J M C Plano, University of East Anglia

- Development and Validation of FAGE (Fluorescent Assay by Gas Expansion) for Local Measurement of Tropospheric OH and HO2
  B J Whitaker, University of Leeds

- Spectroscopic Monitoring of Water Pollution
  J W Finch, Institute of Hydrology

- Remote Spectroscopic Techniques for Measuring Air Pollution

- Use of Temperature and Ozone Measurements obtained with LIDAR
  G Vaughan, University of Wales (Aberystwyth)

Although each lecture was an hour in length, the structure of the overall meeting and the quality of the speakers was such that maintaining an interest in the proceedings was hardly a problem. It was clear that the organizers might expect some members of the audience to have a limited knowledge of the subject as a whole so many of the speakers gave a general introduction to their own work. The first speaker, for example, gave an excellent introduction to the use of spectroscopic techniques for atmospheric monitoring. The audience was guided through the important physical and chemical processes of the different regions of the Earth's atmosphere concluding with an examination of the optical transmission characteristics of the atmosphere in the ultra-violet, visible, infra-red and microwave spectral regions.

Given the range and depth to which each speaker took the audience it was well worth attending for anyone with an interest in the environmental applications of modern spectroscopy. Ed.
EPG Meetings:

The Global Energy and Water Cycle

Venue: The Royal Society, London
18 – 22 July, 1994

This meeting is organised by the UK GEWEX Forum and is supported by the Royal Society, the Royal Meteorological Society, the British Hydrological Society, the Remote Sensing Society and others including the Environmental Physics Group. It will bring together meteorologists, hydrologists and others across Europe involved in the study, via observations, modelling and theory, of processes affecting the energy and water cycle. Session headings include atmospheric processes, precipitation measurement and analysis, land-atmosphere interactions, ocean-atmosphere interactions, continental-scale water budgets, and global modelling.

For further information contact:
The Executive Secretary, The Royal Meteorological Society,
101 Oxford Road, Reading, Berks RG1 7LJ

EPG Visits:

The Meteorological Office, Bracknell
20 September, 1994

This is a half-day visit to the Met. Office in Bracknell and will begin at 2 pm with a short video presentation followed by a tour around some of the departments essential to its operation. This will include the Communications and Central Forecasting departments as well as their computing facilities.

Numbers will be limited to 15 so it is important that members wishing to attend should return their booking slips as soon as they receive them later this year.

Any queries should be addressed to:
J B Stewart,
Address on page 16

EPG Meetings in Preparation:

Electro-technologies for Waste Processing and Purification

Venue: The Institute of Electrical Engineering, Savoy Place, London
November, 1994

This will be a one-day meeting to be held in November and will assess and identify suitable industrial and commercial electro-technologies for future energy efficient waste processing and purification of solids, liquids and gases.

Information and booking forms will be circulated to members when they are available.

G Hossall

Future Events

Other Meetings:

Global Forum '94

25 June – 3 July, 1994

Global Forum '94 has the theme "Cities and Sustainable Development: Strategies for a Sustainable Future". The programme includes an academic conference examining the implementation of Agenda 21, adopted at the UNCED in Rio, June 1992. It will consist of a number of parallel workshops and specialist speaker sessions.

Further details are available from:
Global Forum Conference Organiser,
Dept. of Env. and Geoq. Studies, Manchester Metropolitan University,
John Dalton Extension Building, Chester Street, Manchester M1 5GD
Tel: (061) 227 1563, Fax: (061) 226 7828

Exchange of trace gases between land and atmosphere

12 – 13 July, 1994

Discussion meeting organised by Professor D Fowler, D S Jenkinson, J L Monteith and M H Unssworth. Further details are available from:
The Royal Society,
6 Carlton House Terrace, London SW1Y 5AG

NATO Advanced Research Workshop:
Prospects for Carbon Sequestration in the Biosphere

18 – 22 August, 1994

Contact: Professor O W Heal, ITE-North,
Edinburgh Research Station,
Pensicuik, Midlothian EH26 9QB

British Soil-Water Physics Group Meeting

Scaling problems in soil-water physics

20 September, 1994

Venue: ADAS Soil and Water Research Centre, Trumpington, Cambridge

This meeting will discuss issues of scaling in soil physics, both the use of classical scaling theory and the application of soil physical models at a variety of scales. As with all BSWP meetings, the intention is to bring together workers to share ideas and experiences. The emphasis will be on discussions. Offers of short presentations, describing either theoretical ideas or practical applications, and enquiries to:

Contact: Dr A C Armstrong
ADAS Soil and Water Research Centre
Anstey Hall, Mares Lane, Trumpington, Cambridge CB3 8LF
Tel: (0223) 840011, Fax: (0223) 841618
The EPG Committee

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The views expressed in this newsletter are those of the authors and not those of the Institute of Physics unless otherwise stated.
