Institute *of* **Physics**

Electron Microscopy and Analysis Group

Newsletter

January 2005

ELECTRON MICROSCOPY AND ANALYSIS GROUP

Contents

EMAG COMMITTEE - 2004/2005 SESSION

CHAIRMAN:

Dr Paul D Brown
School of Mechanical, Materials & Manufacturing Engineering ,
University of Nottingham,
Nottingham NG7 2RD.
Tel: 0115 9513748 Fax: 0115 9513800 Email: paul.brown@nottingham.ac.uk

HONORARY SECRETARY / TREASURER:

Dr David McComb
Department of Materials
Imperial College London
Exhibition Road
London SW7 2AZ
Tel: 020 7594 6750 Fax: 020 7584 3194 Email: d.mccomb@imperial.ac.uk

ORDINARY MEMBERS:

Dr Andrew Bleloch
Microstructural Physics
Cavendish Laboratory
Madingley Rd
Cambridge CB3 0HE
Tel: 01223 337333 Fax: 01223 337333 Email: ab122@cam.ac.uk

Dr Richard Baker
Division of Physical and Inorganic Chemistry
Carnelley Building,
University of Dundee,
Nethergate, Dundee DD1 4HN
Tel. +44 1382 34 4330 Fax. +44 1382 34 5517 Email: r.t.baker@dundee.ac.uk

Pete Lander
JEOL (UK) Ltd
Jeol House
Silvercourt
Watchmead
Welwyn Garden City
Herts AL7 1LT
Tel: 01707 377117 (Office) 07967 680752 (Mobile) Fax: 01707 373254 Email: petel@jeoleuro.com

Kevin Meade
Oxford Instruments Analytical
Halifax Road
High Wycombe
Bucks HP12 3SE
Tel: 01494 442255 Fax: 01494 461033 Kevin.MEADE@oxinst.co.uk

Dr Pauline Sillers
Physical Science Team Leader
Technology and Projects Department
Syngenta
Grangemouth
Stirlingshire FK3 8XG
Tel: 01324 498337 Email: pauline.sillers@syngenta.com

Prof. Stephen E. Donnelly
School of Computing, Science and Engineering,
Newton Building,
Salford University,
Salford, Greater Manchester M5 4WT
Tel: 0161 2955392 (Direct)/55505 Email: S.E.Donnelly@salford.ac.uk

Dr Dogan Ozkaya
Johnson Matthey Technology Centre
Bount's Court
Sonning Common
Reading RG4 9NH
Tel: 0118 9242264 Fax: 0118 924 2254 Email: ozkayad@matthey.com

Dr Ian MacLaren
Department of Physics and Astronomy
University of Glasgow
Glasgow G12 8QQ
Scotland
Tel: 0141 330 4700 Email: i.maclaren@physics.gla.ac.uk

CO-OPTED MEMBERS:

Dr Rik Brydson
Department of Materials
University of Leeds
Leeds LS2 9JT
Tel: 0113 233 2369 Fax: 0113 242 2531 Email: mtlrmdb@leeds.ac.uk

John Harrington
Leeds Electron Microscopy and Spectroscopy Center (LEMAS)
Institute for Materials Research, SPEME
University of Leeds
Leeds, LS2 9JT
Tel: 0113 343 2559 Fax: 0113 343 2384 Email: j.p.harrington@leeds.ac.uk

Dr Andy Brown
Institute for Materials Research, SPEME
University of Leeds
Leeds, LS2 9JT
tel: 0113 343 2573 Fax: 0113 343 2384 Email: a.p.brown@leeds.ac.uk

Dr Andrew Scott
Institute for Materials Research, SPEME
University of Leeds
Leeds, LS2 9JT
Tel 0113 343 2573 Fax 0113 343 2384 a.j.scott@leeds.ac.uk

Prof. Amanda Petford-Long
Department of Materials,
University of Oxford, Parks Road Email:
Oxford, OX1 3PH
Tel: 01865 273 656 Fax: 01865 283 333 amanda.petford-long@materials.oxford.ac.uk

Prof. Richard E. Palmer (IoP NPT group)
Nanoscale Physics Research Laboratory
School of Physics and Astronomy
The University of Birmingham
Edgbaston,
Birmingham B15 2TT
Tel: 0121 414 4653 Fax: 0121 414 7327 Email: R.E.Palmer@bham.ac.uk

Prof. Bruce Hamilton (IoP NPT group)
Department of Physics
UMIST PO Box 88
Manchester M60 1QD
Tel: 0161 200 3180 Email: B.Hamilton@umist.ac.uk

A LETTER FROM THE CHAIRMAN

Dear All

The EMAG committee once again has changed line up, in time time-honoured tradition. Rik Brydson steps down as Chairman but continues co-opted onto the committee as Conference Chairman for the EMAG-NANO 2005 meeting. Our thanks to Rik Brydson for his sterling work over the years and for his continued sterling work hosting the EMAG-NANO 2005 event. I now progress from Secretary to Chairman and Dave McComb (Imperial College London) takes over the onerous task of Honorary Secretary / Treasurer (brave man). Amanda Petford-Long (University of Oxford) has also stepped down, but continues co-opted onto the committee as proceedings editor for EMAG-NANO 2005, alongside Richard Baker. Again we express our heartfelt thanks for Amanda's contribution to the running of the very successful EMAG 2003 conference in Oxford. We also welcome our new committee members, Prof. Stephen E. Donnelly (Salford University), Dr Dogan Ozkaya (Johnson Matthey Technology Centre) and Dr Ian MacLaren (University of Glasgow) to help us maintain the EMAG tradition.

The main event for 2005 is the EMAG-NANO 2005 meeting to be held at the University of Leeds, August 31st – September 2nd, preceded by a 1-day Postgraduate Advanced School on 30th August. There are a few slight departures from the conventional EMAG conference series for this particular event. Notably, EMAG has joined forces with the Nanoscale Physics and Technology group of the IoP, aiming to bring together both communities under the banner of 'Imaging, Analysis and Fabrication on the Nanoscale.' Thus, in addition to a set of overview plenary talks, we aim to run three parallel sessions, rather than the traditional two, covering aspects of Microscopy techniques for nanotechnology; Investigations of structure-property relationships in advances materials, and Nanophysics and nanotechnology. The aim is to adopt electronic submission procedures for conference papers, with a view to reviewing contributions in advance of the meeting. The intention here is to speed up the publication of the proceedings which will still be in hard copy format, as part of the Institute of Physics Conference Series, providing a valuable snap-shot of current UK activity in this area. The aim is also to ensure that referees can freely enjoy the conference without feeling distracted by the task of refereeing during the meeting itself. The Microscopy and Nanotechnology Trade Exhibition continues to be an equally important component of the conference. This will be mounted in the University Sports Centre alongside the poster presentations. There will also be an area dedicated to Trade

presentations interlaced with the conference scientific programme. Please see the enclosed Second Circular for details of the event and note the abstract submission deadline of 18th March. 2005. Please also see http://conferences.iop.org/EMNA/.

We also draw your attention to the 1-day EMAG meeting on Electron Microscopy of Catalysts, organised by Dogan Ozkaya, to be held at the IoP, 76 Portland Place, London on Wednesday 27th April. Again, please see the enclosed flyer.

One of the main purposes of the EMAG group is to support the next generation of research scientists with an interest in electron microscopy and analysis. The UK has a long, and distinguished history in the principles and practice of electron microscopy, and we are keen to maintain this tradition. Historically, the income generated through the running of the EMAG conference series goes into an accrual fund (also supported by the IoP)), which is used to fund student bursaries. Accordingly, supervisors are reminded that conference bursaries are available for UK research workers, who are members of the IoP/EMAG and/or the RMS, to attend any appropriate meeting at home or abroad. Please see the bursary application form at the end of this Newsletter, or on the EMAG web-site at: http://groups.iop.org/EM/.

Paul D Brown, University of Nottingham

EMAG Chairman

EMAG – NANO 2005

As detailed in the last newsletter EMAG-NANO 2005 "Imaging, Analysis and Fabrication on the Nanoscale" will be held at the University of Leeds from Wednesday 31st August to Friday 2nd September 2005. As part of the "Einstein" International Year of Physics, this time the event will occur in collaboration with the Nanoscale Physics and Technology (NPT) Group of the Institute of Physics. The scientific programme organised by David McComb and Bruce Hamilton is well underway with plenary and invited speaker acceptances from F Besenbacher (Århus University, Denmark), H J Freund (Fritz-Haber-Institut der Max-Planck-Gesellshaft, Germany), C Humphreys (University of Cambridge, UK), Z L Wang (Georgia Institute of Technology, USA), N Browning (University of California-Davis, USA), M Castell (University of Oxford, UK), A G Cullis (University of Sheffield, UK), M Green (University of Oxford, UK), P Haynes (University of Cambridge, UK), P Nellist (Trinity College Dublin, Ireland), R Palmer (University of Birmingham, UK), A Petford-Long (University of Oxford, UK), M Rainforth (University of Sheffield, UK), A Robinson (University of Birmingham, UK), A Warley (Kings College London, UK) and P Williams (University of Nottingham, UK).

The one day Postgraduate School on Tuesday 30th August is slowly taking shape with Andrew Bleloch, Quanmin Guo and Bruce Hamilton confirmed as speakers on Microscopy and Nanotechnology. This series of lectures is designed to prepare students for the detailed conference themes and represents a departure from the normal Advanced School, owing to the broader base of conference attendees.

It has been agreed that the Microscopy and Nanotechnology trade exhibition including workshops will be marketed and coordinated by an outside company, the CEM group who already have involvement with the Institute of Physics. Hopefully this will result in an enlarged, much more professional exhibition with increased one day visitor attendance. All attendees will be offered accommodation in Devonshire Hall of Residence, which offers both standard and ensuite rooms and is a short walk or bus ride from the Leeds University Campus. The social programme will include a Welcome Reception in Devonshire Hall, a Trade Exhibition Buffet, a historical and architectural tour of Leeds City Centre and a Conference Dinner in the Royal Armouries Museum. We also hope to confirm some "regional" entertainment in the near future.

For further details of the conference please contact Claire Pantlin at the Institute of Physics or visit the website http://conferences.iop.org/EMNA

Rik Brydson
Conference Chairman

Electron Microscopy of Catalysts

Wednesday 27 April 2005

The Institute of Physics, 76 Portland Place, London W1N 3DH

Catalysts are the oldest known nano-materials, and yet they are probably the least understood in terms of their functional properties. Recent developments in electron microscopy have enhanced research efforts to develop better catalysts and provided improved understanding of their underlying mechanisms. Approaches include the use of tomography, spherical aberration correction, high-resolution imaging and high-resolution spectroscopy. Accordingly, the aim of this meeting is to bring together research workers with an interest in catalysis and characterization and to encourage interactions. The application of spherical aberration corrected microscopy, including case studies from the Oxford OJ aberration corrected microscope and the Super-STEM facility in Daresbury, will be presented.

Invited speakers and topics suggested for presentation:

3D analysis of heterogeneous catalysts by electron tomography
Paul Midgley (University of Cambridge, UK)

Aberration corrected imaging of Nanostructures and Catalysts
Angus Kirkland (Oxford University, UK)

Super-STEM applied to catalysts
Mervyn Shannon (ICI and SuperSTEM facility, UK)

Abstract Submission

Both oral and poster contributions are invited from the above areas of interest. The abstracts (200 – 250 words in length) should be submitted by email by no later than **Monday 28th March 2004**. Instructions and an abstract template can be obtained by sending a blank email to *confs@ioppublishing.com* with *'Catalysis instructions'* as the subject.

The Oxford-JEOL Aberration-Corrected Microscope

It was around the time of the last EMAG conference that the new Oxford-JEOL (OJ) microscope was packed into crates at the Tokyo factory and sent over to our Begbroke site, 6 miles north of Oxford. Installation took a mere 10 weeks and we took over at the controls in December 2003. Timely then for the EMAG newsletter editor to ask for an update.

The OJ microscope is a JEM 2200FS TEM/STEM equipped with a FEG source, an in-column filter and operation via a bank of computers - no screen, no binoculars. The key components are of course the two aberration-correctors. One corrects the TEM image; it is always on and we have found its operation to be straightforward. Without spherical aberration, three-fold astigmatism etc, the point-to-point resolution extends to the information limit of around 0.12nm and raw images are prettier and sharper as there is less delocalisation. The significant results however have come from focal series from which we restore the complex wavefunction at the specimen exit plane. Block oxides, grain boundaries in doped silicon nitride and semiconductor structures are just a few of the materials examined. Work is now progressing to tilt-focal series. Cs-correction can also improve energy filtered imaging and results for copper precipitates in steel are being compared with results from our 300kV JEOL 3000F with GIF.

The second corrector removes the aberrations from the probe forming lens, giving us a smaller probe and allowing us to use larger apertures to put more current into the probe. Alignment is a two step affair - first we adjust higher order aberrations with images of a special gold-island-on-thin-amorphous-film sample, then we fine-tune the coma, two-fold astigmatism and focus with ronchigrams from the actual sample to be studied. The probe is small enough to generate atomic resolution HAADF images revealing, for example, the precise pattern of segregation of dopant atoms at the intergranular film / silicon nitride interface. We also have images of the silicon dumbells and of twin boundaries in gold where the atomic columns are separated by 0.166nm. The combination of the two correctors on the OJ microscope allows us i) to take high resolution TEM and HAADF images of the same specimen region and ii) to image the probe size and shape. While the first is straightforward and already very informative about quantitative aspects of imaging, the second is trickier. Since we use the same lens - the objective lens - to form the probe and to image it, we cannot adjust one without affecting the other. And if the defoci of the probe and image are intermingled, so are other higher order aberrations such as six-fold astigmatism. Having mastered, more or less, the imaging modes, we are moving now into the analysis capabilities of the instrument: EDS with higher probe currents and HAADF combined with EELS. Next year should see the addition of a monochromator to the OJ facility which will allow higher energy-resolution EELS. TEM should achieve a higher spatial resolution too, with the reduced energy spread extending the information limit to below 0.1nm. In conclusion, we can report that the OJ is working well, remarkably well considering the integration of so many new components and application programs and networks. The five or so local operators are scaling the learning curve, and the several visitors from around the world have also seen that aberration correction is, at long last, really attainable.

Crispin Hetherington
Dept Of Materials, Univ of Oxford

SuperSTEM

The latest SuperSTEM newsletter can be viewed at,

http://www.superstem.dl.ac.uk/

FREE - MEMBERSHIP OF EMS

EMAG members are reminded that they are all automatically members of the European Microscopy Society, at no cost to themselves. However, in order to receive information from the EMS, it is essential to send your e-mail address to the EMS secretary - this cannot be sent by the IoP due to the Data Protection Act. This is important, since almost all communications from the EMS are sent by e-mail, including information for voting for the next Executive Board.

Send your e-mail address (and preferably your other details, postal address, phone & fax numbers) to

wisse@cyto.vub.ac.be and to hawkes@cemes.fr

and indicate whether you agree to include this information in the EMS Yearbook. If you do NOT wish to appear in the Yearbook, your e-mail address will be used solely for the dispatch of information by the EMS secretary (Prof. Dr E. Wisse, Free University of Brussels).

MEETING REPORTS

13th European Microscopy Congress
Antwerp. Belgium, 22-27th August 2004

It is my pleasure to take this chance to thank you for the award supporting my attendance at 13th European Microscopy Congress 2004 in Antwerp, Belgium. I gained a great deal of precious experience at my first international conference. There were many interesting oral presentations provided by researchers from many countries. Within the four and half day-conference, there were about 400 oral presentations presented in parallel at six lecture halls, and hundreds of posters presented at the exhibition hall. Since there were many interesting talks given at the same time, I chose those interested me the most, such as the works about aberration-corrected microscopes (e.g. A versatile double aberration-corrected, energy-filtered HREM.STEM for materials science by J. Titchmarsh), (S)TEM imaging (e.g. Imaging and spectroscopy with a 0.1nm probe by A. Bleloch), EELS/ELNES (e.g. Electron energy-loss spectrometry at high energy resolution for materials research by F. Hofer) , investigation of nanoparticles (e.g. Structural aspects of transition metal nanoclusters studies with transmission electron microscopy by T. Vystavel), etc., to attend.

The poster sessions also provided great opportunities to get to know other groups' work on a one-to-one basis, and exchange ideas. I also presented my work on the first two-day sessions, and quite a few people were interested in my work. Whilst explaining my work, their questions also inspired possible future experiments. From various different kinds of presentations, I was very impressed with the amazing work being undertaken in the microscopy field. What I have experienced at this conference makes me want to work harder to obtain great results. I also attended one of the excellent Sunday courses about STEM imaging by Dr. Nigel Browning which well explained and summarised this analytical technique. Besides the scientific/technique learning aspect, attending this conference was also an excellent chance for me to meet other researchers from different research institutes and companies and I had a great time with these new friends discussing our work and other topics, such as culture. Once again, thank you for your support and I have really benefited from attending this fabulous event. I am really looking forward to attending the next conference.

Ying-Hsi Pan (Unversity of Leeds)
sponsored by EMAG bursary

13th European Microscopy Congress
Antwerp. Belgium, 22-27th August 2004

The 13th European Microscopy Congress was held at the University of Antwerp in August this year. The conference was split into three main areas; Instrumentation & Methodology, Materials Sciences and Life Sciences and there were many interesting and exciting lectures to attend in each of the three categories.

This was one of the first conferences that I have attended and I found it fascinating to meet so many leading names in the field of electron microscopy. The conference gave me the opportunity to discuss my work with other scientists. This has given me many ideas of how to progress with my research.

I was also fortunate to be able to present two areas of my research. I gave an oral presentation in the Electron Holography session which lead to some interesting discussions. I also gave a poster in the Si-based semiconductor sessions which met an interested audience and followed closely the work presented in some of the talks given in this session.

In summary I found this conference valuable scientific experience. It enhanced my understanding of many areas of microscopy and gave me the opportunity to present my work. I would like to thank EMAG for their financial support.

Philipa Somodi (Unversity of Cambridge)
sponsored by EMAG bursary

13th European Microscopy Congress
Antwerp. Belgium, 22-27th August 2004

The thirteenth European Microscopy Congress was held in Antwerp, Belgium between the 22nd and 27th August 2004. The congress was divided into three main categories: Instrumentation and Methodology, Materials Sciences and Life Sciences. The location of the conference venue provided an additional opportunity for most delegates to mingle and make new acquaintances during the bus journey between the hotels, which were predominantly in the centre of Antwerp, and the Middleheim Campus of the University of Antwerp.

The scientific programme was well organised, with oral sessions before and after the poster sessions, which were held over an extended lunchtime. All sessions were well attended, and the conference photographers have captured the essence of the conference atmosphere as is evident in the photographs on http://www.emc2004.be/. In addition to a plenary lecture every morning there was also an excellent range of special interest lunchtime talks on topics ranging from art and archaeology to geckos. The commercial exhibition was split between the area surrounding the seminar rooms and the poster hall, and provided an excellent opportunity to discover the latest commercial developments in microscopy and sample preparation.

I was pleased to be able to present my paper on 'Electron holography of a tapered *p-n* junction' as an oral contribution during the material sciences session on silicon based semiconductors. I also had many discussions with other European microscopists on this and other related topics during the conference. I found that the conference provided an excellent opportunity to discuss current and future research with a broad cross-section of the microscopy community. I would like to thank EMAG for their contribution towards conference expenses.

Alison Twitchett (Unversity of Cambridge)
sponsored by EMAG bursary

Microscopy and Microanalysis Conference 2004.
Savannah, Georgia, 1-5 August 2004

This year the Microscopy and Microanalysis Conference took place in Savannah, Georgia on the 1st to the 5th of August. Savannah is Georgia's first city, founded by the British General, James Oglethorpe, and is full of original architecture having not been disturbed during the civil war. The meeting was held in the conference centre situated on the riverfront opposite the city and a ferry was required to transport the delegates to and from their hotels.

The main purpose for my visit to M&M was to present my work through a platform presentation as well as several posters on the advances of low-loss electron energy loss spectroscopy mapping in a STEM. The oral presentation, which demonstrated how the effective electron mass could be calculated in direct-gap semiconductors using energy loss spectra was very well received, and a lot of interest was paid to the posters which showed the ability of using the low-loss data to quantify elemental compositions.

As M&M is one of the larger microscopy conferences there were many parallel sessions running. The parallel sessions could be split into two areas of interest, biological sciences and physical sciences, with a lot of interest on the advancement of equipment, especially computer technology, which is having a massive impact on research. This was most evident with 3D-reconstruction, particularly with topography within a TEM and also chemically mapping slices produced using a Focus Ion Beam and then using computer software to reconstruct 3D images of the chemical data.

Overall, the standard of the talks were of a very high standard and very informative. I found that the plenary talks were especially good and several of them were asked to repeat their talk at a later time for those who had missed it. I have come back from the conference with a lot of new ideas for my PhD and for the future, and have been introduced to many research groups and people from around the world, who I might not have had the fortune of meeting otherwise.

Mhairi Gass (University of Liverpool)
sponsored by EMAG bursary

MRS FALL Meeting 2004.
Boston, USA 29 Nov - 3 Dec 2004

The 2004 MRS Fall Meeting took place in Boston, USA on the 29th November to the 3rd December 2004. The materials community continues to grow, being the bedrock of cross-disciplinary efforts that are pushing the envelope on the technology horizon. Symposium organizers from around the world have created a program that captures the revolutions occurring in the materials community and explores new and emerging fields at the forefront of interdisciplinary science. Forty-two (42) technical symposium topics were located at Hynes Convention Center and Sheraton Boston Hotel. The exhibition, featuring over 200 international exhibitors, offered a wide variety of innovative products and services relevant to the materials community.

It is my pleasure to take this chance to thank EMAG for supporting my attendance. I visited this meeting to present my work through a platform presentation on TEM characterisation of fatigue tested lamellar Ti-44Al-8Nb-1B. The oral presentation shows the result of detailed microstructural examination by TEM of fine-grained polycrystalline lamellar Ti-44Al-8Nb-1B after fatigue testing (R=0.1) at room temperature. The results showed no strong relation between operative slip systems and macroscopic Schmid factor and it is believed the local stress conditions control the operation of the slip systems.

There were many interesting oral presentations provided by researchers from many countries, from which I gained a lot of ideas. Since there were many talks given at the same time, I chose those I am interested most, such as: Advances in Materials Characterization - which underpins all materials discoveries, highlighted the recent explosion of new approaches in scanning probe microscopies, electron microscopy, and neutron and x-ray scattering techniques that promise to provide unprecedented insight into nano- and multiscale phenomena; The Mechanical Behavior - explored the unique mechanical properties of functional and nanoscale materials including challenges poised by nanoscale characterization and the stability of interfaces and films, innovations in active materials, intermetallics, and the unique property suite of biological materials. Specially, I focused on the integrative and interdisciplinary aspects of intermetallics, which is very close to my project.

The meeting also provided an excellent opportunity to meet and discuss with other researchers.

Hui Jiang (The University of Birmingham)
sponsored by EMAG bursary

FUTURE MEETINGS OF INTEREST

5 - 9 June 2005
12th International Conference on Electron Microscopy of Solids, Kazmirierz Dolny, Poland
katcki@ite.waw.pl

5 – 8 July 2005
MC7: Functional Materials for the 21st Century, Edinburgh, UK
http://www.rsc.org/MC7

31 July - 4 August 2005
Microscopy & Microanalysis-2005, Honolulu, HI
http://www.MSA.microscopy.com/

31st August – 2nd September 2005
EMAG-NANO 2005, University of Leeds
http://conferences.iop.org/EMNA/

5 - 8 September 2005
EUROMAT 2005, Prague, Czech Republic
http://www.euromat2005.fems.org/

6 - 10 August 2006
Microscopy & Microanalysis-2006, Chicago, IL, USA
http://www.MSA.microscopy.com/

3 - 8 September 2006
16th International Microscopy Congress, Sapporo, Japan
http://www.imc16.jp

ELECTRON MICROSCOPY AND ANALYSIS GROUP

Contact Points

IoP: Institute of Physics, Conference Dept., 76 Portland Place, London, W1N 4AA.W1B 1NT, UK
Tel: +44 171 20 7470 4800, Fax: +44 171 20 7470 4900
Email: conferences@iop.org
http://www.iop.org/IOP/Confs/conferences.iop.org

MRS: Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237, USA.
Tel: +1 412 779 3003, Fax: +1 412 779 8313
http://www.mrs.org/meetings/

MSA: Microscopy Society of America, 4 Barlows Landing Road, Suite 8, Pocasset, MA 02559, USA.
Tel: +1 508 563 1155, Fax: +1 508 563 1211
http://www.MSA.microscopy.com/

RMS: Royal Microscopical Society, 37/38 St. Clements, Oxford, OX4 1AJ.
Tel: +44 1865 248 768 Fax: +44 1865 791 237
Email: meetings@rms.org.uk http://www.rms.org.uk/events/

EMAG BURSARY APPLICATION FORM

PERSONAL DETAILS			
Name		**Email**	
Address			
Title		**Age**	
IoP/EMAG Member	Yes / No	IOP Number	Applying for Membership
Current Status	FT Student	Postdoc	Other - specify

CONFERENCE DETAILS		
Name of Meeting		
Date of Meeting		
Place of Meeting		
Title of Paper/Poster		
Has paper been accepted for presentation?	Yes	Don't know yet

SHORT COURSE DETAILS	
Title of Course	
Date of Course	
Place of Course	

FINANCIAL DETAILS		
Estimated Expenditure	**Registration Fee** **Travel Costs** **Accommodation** **Subsistence**	
	Total	**£**

Have you been promised a contribution towards your funding from any other sources?	Yes / No
If so, please specify the source and the amount they are prepared to contribute	

Have you received an EMAG bursary within the last 12 months?	Yes / No

SIGNATURE		**DATE**	

Please send completed form and

- ***a letter of support from your academic supervisor*** **and**
- ***a copy of your paper abstract*** **(if applicable)**

to : Professor S E Donnelly, Faculty of Science Engineering and Environment, Cockroft Building (Room 105 Salford University, Manchester, M5 4WT, UK (Email: S.E.Donnelly@salford.ac.uk)