

Institute *of* Physics

Electron Microscopy and
Analysis Group

Newsletter

January 2007

ELECTRON MICROSCOPY AND ANALYSIS GROUP

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EMAG COMMITTEE - 2006/2007 SESSION

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A LETTER FROM THE CHAIRMAN

Dear All

The EMAG committee once again has changed line up, in time time-honoured tradition. Paul Brown steps down as Chairman but continues on the committee as Proceedings Editor for the EMAG 2007 meeting. Our thanks to Paul for his sterling work over the years and for his ongoing contribution to EMAG 2007. I now progress from Secretary to Chairman and Richard Baker (University of St Andrews) takes over the onerous task of Honorary Secretary / Treasurer. We welcome Dr Pete Nellist (University of Oxford) to his second stint as an EMAG committee member. We also welcome Dr Maureen MacKenzie (University of Glasgow) and Professor Michael Doughty (Glasgow Caledonian University) as co-opted members to help with the organization of EMAG 2007.

The main event for 2007 is the EMAG 2007 meeting to be held at Glasgow Caledonian University, 5–7 September 2007, preceded by a 2-day Postgraduate Advanced School at the University of Glasgow on 3-4 September. After the 2005 meeting we return to a more conventional EMAG conference format with three plenary speakers and two parallel sessions each day. Once again 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 Trade Exhibition continues to be an equally important component of the conference. This will be mounted in the Arc Health and Fitness Centre at Glasgow Caledonian University alongside the poster presentations. There will also be an area dedicated to Trade presentations interlaced with the conference scientific programme. The call for papers will be sent out in the near future. At this stage please note the abstract submission deadline of 26th March, 2007. Please also see <http://www.iop.org/Conferences> for more details.

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/>.

David W McComb
Imperial College London

EMAG Chairman

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).

LEEDS UNIVERSITY MAKES SMALLEST XMAS CARD

A schools competition to design a miniature Xmas card that can be etched onto the head of a pin using a Focused Ion Beam (FIB) machine and viewed using a Scanning Electron Microscope was hosted by the Materials Science and Engineering Department in the Engineering Faculty at the University of Leeds. The School visited on 12th December where they were showed all the designs and the winner was announced. The magnification of the FIB image was about 20,000 times which means that the total area of the head of the pin had been magnified to about the size of a football pitch. The designs submitted by Schoolchildren from Bronte House School (part of Woodhouse Grove School at Apperley Bridge) were reduced in size to about 100 times smaller than the diameter of a human hair, i.e. about the size of a human red blood cell, and etched onto the head of a pin by John Harrington of the Institute for Materials Research. The original vision of Richard Feynman (the Nobel prize winning American physicist) was to write the whole 24 volumes of the Encyclopedia Britannica on the head of a pin. Based on the final size of this design, we can fit about 1 million similar sized Xmas cards on the head of a pin and we are registering this with the Guinness Book of Records for the smallest Xmas card. In practice, we can actually work at about one hundred to one thousand times smaller than this, so in principle we could fit all the Xmas cards sent in the UK this Christmas on this one pinhead !

Professor Rik Brydson, University of Leeds

MEETING REPORTS

EMAG-NANO (31 August – 2 September 2005) : Prize-winner's Report

Having been introduced to electron microscopy during my PhD at Sheffield University, it was quite an insight at EMAG-NANO 2005 to view the potential of such a broad field of investigative techniques, above and beyond the scope of my metallurgical based research.

An excellent exhibition showcased the very latest technology, with a very hands-on approach to the available equipment. Of particular interest were the FEI stand with their FIB-ESEM demonstration, as well as the Hitachi stand and their heat sensitive mugs! Caricatures of colleagues and an excellent buffet and brass band all added to the relaxed atmosphere.

From a scientific point of view, thought provoking plenary lectures by Professors Zhong L. Wang and Colin Humphreys on oxide nanostructures and future challenges in electron microscopy, respectively, were complimented by a diverse oral program, ranging from extreme theoretical to niche practical applications. Overall, I thought the quality of the student presentations as well as the poster contributions was very high.

Finally, having never dined in a museum before, I found the Royal Armouries a fascinating location for a conference dinner, amongst the medieval suits of armour and modern machine guns. Despite the rain on the last day an interesting conference was had by all, made possible by a bursary covering the registration fee. Many thanks.

John Walker (Sheffield University)

First Prize in the Poster competition for: '*Site specific SEM/FIB/TEM for analysis of lubricated sliding wear of aluminium alloy composites*'

EMAG-NANO (31 August – 2 September 2005) : Prize-winner's Report

I must say that the EMAG-NANO 2005 conference was a great experience for me. As a PhD student it was my first opportunity to show results of my work to a scientific audience. The seminar and talks were very interesting, and a wide range of topics were presented. At the same time I could learn about new techniques and equipment at the big manufacturer's exhibition. Also, I could meet people of the microscopy community in an informal way during a guided visit to the centre of Leeds and the pub outing afterwards. And I remember the conference dinner which was held in an amazing place: The Royal Armouries Museum of Leeds. And the best ending had to come, I presented a poster that later on was awarded second prize! I have a great souvenir of my first attendance to a scientific conference.

Lionel Cervera-Gontard (University of Cambridge)

Second Prize in the Poster competition for: '*Linear delocalisation on nanoparticles*'

MEETING REPORTS

16th International Microscopy Congress (3 - 8 September 2006) Sapporo, Japan

The aim of the International Microscopy Congress, which is held every 4 years, is to bring together microscopists, researchers and exhibitors from all over the world in order to contribute to the development of microscopy and related fields. In recent years, interest in microscopy has been extended to a wide range of research fields that include “Nanotechnology”, “Biotechnology” and “Information Technology”. Consequently, the main theme of this particular congress was “Microscopy for the 21st Century- Contribution to Life and Materials Science”. Over 2000 delegates attended the five days of plenary lectures, topical interest symposia and poster presentations.

I am currently in the third year of my PhD and I was given the opportunity to present some of my results with an oral presentation at the congress. My presentation centred upon the study of III-V heterostructures for semiconductor applications. These materials are composed of a series of ultra thin layers whose precise configuration allows the motion of charge carriers to be controlled through energy band engineering. The materials were studied through the use of an aberration corrected Scanning Transmission Electron Microscope (STEM) called SuperSTEM. This allowed the quality and composition of several important heterostructure systems to be investigated at atomic scales.

My talk formed part of the “Instrumentation: Advancing High Resolution TEM and STEM” symposium. This particular symposium was actually dedicated to John M Cowley who was one of the pioneers of (electron) microscopy. My presentation took place in the largest hall at the congress and was well attended by the delegates. There also seemed to be a reasonable level of interest in my work after the talk. Furthermore, this was my first oral presentation at an international event and, despite it being a rather daunting task, it did provide me with invaluable experience. The congress also gave me the chance to meet with a range of people both within and outside my field. This gave me a broader perspective on the kind of research being undertaken throughout the world.

At the start of the congress, S. Pennycook from Oak Ridge National Laboratory gave a very interesting talk on the benefits of aberration corrected STEM. He also discussed his way of understanding the theory behind a type of imaging technique that I often use on SuperSTEM. Also of note was a talk by Ondrej Krivanek from the Nion Company. This focused on new approaches in the instrumentation for high resolution TEM and STEM. I also attended a symposium on recent advances in sample preparation techniques. These techniques are especially important because the quality and nature of the sample is ultimately the main limiting factor in what can be achieved using electron microscopy. Regardless of the fact that most of the presented techniques required the purchase of an array of expensive instruments, there were a few ideas that may be applied in the lab at Glasgow.

In addition to the conference, there was plenty to do and see in Sapporo. This city was in actual fact host to the 1972 Winter Olympics but, unfortunately, I never managed to take a trip out to the ski centre. On the other hand, I did climb a nearby hill called Mount Moiwa albeit with the use of a funicular railway. This gave spectacular night views of the city and surrounding areas. Other areas of interest included Odori-koen Park, the Hokkaido shrine and the Sapporo dome- all of which I visited.

Sapporo is in fact a fairly young city (only about 140 years old) but still boasts some interesting history. I visited the former Hokkaido Government Building that explained some

of the background to the formation of the city. This included how the land that belonged to the first inhabitants of the area (named the Ainu / Utari) were progressively taken over by colonising Japanese from the southern islands. This resulted in widespread discrimination of the Ainu / Utari that is still being readdressed even today. Despite that, I found everybody I met to be very welcoming and helpful. On the third day there was also a visit of the Emperor and the Empress of Japan to the congress. This was actually on the very same day that a male heir was born into the imperial family. As you can imagine, the news media was awash with news of this event.

Overall, IMC16 was a very worthwhile experience and I would like to thank EMAG for their generous financial support.

Paul Robb (University of Glasgow)
sponsored by EMAG bursary

16th International Microscopy Congress (3 - 8 September 2006) Sapporo, Japan

Sapporo is a uniquely young city having both a distinctive Japanese feel (public bath houses, karaoke bars etc.) and a western influence (the symbol of the city is the Tokeidai or clock tower). The birth of Sapporo heralded the modernisation of Japan, so perhaps it was fitting that the theme of the conference was '*Microscopy for the 21st Century: Contribution to Life and Materials Science*'. This was reflected in the organising committee's choice to embrace all forms of microscopy, including light, atom probe, ion and x-ray microscopy, thus becoming for the first time IMC rather than ICEM.

Over 2000 people attended representing 63 countries. The majority of the delegates were in the Materials science field but there were just as many sessions from the Biological community.

I presented a poster on my current research as part of the Advancing HR-TEM and HR-STEM session. My poster examined, through theoretical calculations, the possibility of depth sectioning in zone-axis crystals using aberration-corrected STEM. I received positive feedback about my poster and came away with fresh ideas for my future research. I enjoyed both the talks from leading and eminent scientists (it was nice to put a face to a name) as well as young scientists (so that I will be able to put a name to a face). In addition, I attended the Pre-congress school, getting to the chance to meet with other early career scientist and hear about some developing techniques.

I was honoured to receive an invitation to the Special Reception with their Majesties the Emperor and the Empress. It was an auspicious day due to the birth of their Majesties grandson, Prince Hisahito. I also attend the concert and ceremony and thoroughly enjoyed His Majesty the Emperor's address, in which he discussed his own experience with an electron microscope.

I would like to thank the Electron Microscopy and Analysis Group for the bursary which made travelling to the Congress possible.

Eireann Cosgriff, Trinity College Dublin
sponsored by EMAG bursary

MEETING REPORTS

XIII International Symposium on Small Particles and Inorganic Clusters (23-28 July 2006), Gothenburg, Sweden

This conference brings together those working in the fields of atomic and molecular nanoclusters. My attendance at the conference was particularly relevant, since I have been doing research into supported nanoclusters using transmission electron microscopy, since commencing my PhD in October 2004, and this was the first opportunity to attend a cluster meeting. ISSPIC 13 was held at the impressive conference centre located on the Chalmers University campus, and attracted scientists from all over the world; with a good mix of distinguished professors, academics and also PhD students in attendance.

The conference covered five days, with sixteen scientific sessions, consisting of a mix of plenary lectures, invited contributions and short 'hot-topic' presentations. The plenary talks allowed me to listen to inspiring presentations from researchers who have been at the forefront of their field for many years. These included Professor Stephen Berry, Professor Karl-Heinz Meiwes-Broer and Professor Masatake Haruta to name but a few. Of the shorter talks, those concerning the structure and properties of gold nanoclusters were of particular interest, since I have recently been studying these myself.

Poster sessions were also organised to allow an opportunity for those not selected for oral presentations to show their work. Many posters were presented by PhD students; and I presented two posters of my own during the Wednesday and Thursday sessions. I was lucky to have considerable interest in my posters from a wide range of delegates. The sessions provided a good opportunity to speak to new people and make contacts. Interesting discussions were had with many people with similar research interests to my own, including Dr Shaun Hendy from New Zealand, Tommi Järvi from Helsinki and the many other PhD students from the universities of Leuven and Karlsruhe to name a few.

The week was broken up on Wednesday afternoon by a group boat trip along the river Göta and out into the archipelago. The weather was very warm and sunny and showed Sweden in the best possible light. The trip was followed by a conference dinner which was excellent.

Overall the conference was of an extremely high scientific standard and I believe I have benefited greatly from attending. I wish to thank EMAG for their generous contribution towards my conference expenses.

Neil. P. Young (University of Birmingham)
sponsored by EMAG bursary

MEETING REPORTS

Microscopy and Microanalysis Conference (30 July to 3 August, 2006), Chicago, USA

At the time of the 2006 annual M&M meeting, Chicago was afflicted with a heat-wave and high humidity which made my enthusiasm to walk from my hotel to the conference on the first day look a bit foolish. The conference was held in the Festival Hall of Navy Pier, which made for a pleasant location, although it did seem a little strange to walk to sessions past candy-floss munching tourists.

Two pre-meetings were held on the weekend prior to the main conference: One was a workshop entitled “New Approaches to Marketing, Managing and Money for Maintaining a Core Facility”, and the other a topical congress on “Materials Research in an Aberration-Free Environment” to discuss latest developments and applications of aberration correctors.

The main conference was one of the best attended M&Ms of recent times, with a total attendance of 3137 from 33 different countries. The large attendance was apparent in the “Advances in STEM” symposium that I attended. Despite the allocation of a large room, it was hard to even find standing room.

The programme had the usual diversity of an M&M meeting, ranging from “Ask the experts” sessions to the usual contributed symposia. One feature of the meeting was that closely related symposia ran consecutively in the same meeting room. For example, the two-day “Advances in STEM” session was immediately followed by an EELS session. As usual, there was an extensive trade exhibition alongside the poster presentations and an internet café that proved to be a useful meeting point. The only criticism I have of the meeting layout was that switching sessions between talks often involved long hikes to meeting rooms at the other end of the complex.

I will not attempt to discuss the wide range of science presented at the meeting, but it was remarkable how much more quantitative interpretation of data is now being undertaken. Overall I felt that the scientific quality of the meeting was good for such a large conference, and it looks like the M&M meeting is in good health.

P D Nellist (University of Oxford)

MEETING REPORTS

In Situ Electron Microscopy and Analysis (30 June 2006), London

The one-day meeting on In Situ Electron Microscopy and Analysis was organised by EMAG and took place at the Institute of Physics in London. The programme consisted of three Plenary lectures, seven Contributed oral presentations and a poster session with eight contributions. Time was set aside in the programme for delegates to view the posters and for informal discussions during the coffee breaks and over an extended lunch break. Around 40 delegates attended the event and there was a strong international representation with speakers from as far afield as the USA and Japan as well as from UK institutions.

We were very pleased that Professor Pratibha Gai was able to attend the meeting and give the first Plenary lecture. Professor Gai is in the process of relocating from DuPont, USA, to the University of York. In her lecture, she described the pioneering work of her group in developing atomic-resolution environmental TEM (ETEM) and how this technology had been applied to study the relationship between the nano-structure of catalyst materials and their activity and selectivity by observing their behaviour in situ under reaction conditions. The TEM theme was continued in the second Plenary, which was given by Professor Judith Yang of the University of Pittsburgh. Professor Yang presented research on the interaction of metal surfaces with atmospheric oxygen and described real-time studies of the formation of oxide islands and other novel features on specific Cu and Cu-Au surface planes. There then followed three contributed presentations. In the first, Dr Takeo Kamino of Hitachi High-Technologies Corporation described a novel TEM sample holder in which sample material was placed directly on a heated filament. Temperatures of up to 1500°C and gas pressures of up to 2.5×10^{-2} Pa could be achieved, allowing reduction-oxidation behaviour of In and SiO₂ particles to be followed. Christian Lang of the University of Oxford presented cross-sectional TEM images in which the interplay between strain and composition caused changes in the morphology of GeSi islands deposited on a Si(011) surface. Dr Vlad Stoljan, from the University of Surrey, discussed the growth mechanism of carbon nanotubes from Ni catalysts. By reversing the growth mechanism under the TEM electron beam, it was shown that the catalyst is Ni₃C, rather than being pure Ni, and that the growth mechanism depends on a high surface coverage of C and on high rates of surface diffusion of C.

Over the lunch break that followed, delegates had the opportunity to view the posters. A range of interesting novel techniques and applications was represented. These included the use of ESEM to study the growth of WO_x nanorods (DC Cox and co-workers, University of Surrey) and high temperature in situ SEM techniques for following reactions, grain growth and phase transitions in steels (Iain Fielden, Sheffield Hallam University). Professor John Wheeler presented related work in the field of metallurgy which employed in situ Electron Backscattered Diffraction in a purpose-built instrument at Liverpool University to study phase transitions and grain growth in Titanium at elevated temperatures. The study of magnetic materials was represented by Dr Westman of Omicron Nanotechnology, Germany, who presented their SEMPA (SEM with Polarisation Analysis) technique for resolution of magnetic domains in nanostructured materials in the 10 nm regime. Dr Ozkaya of Johnson Matthey presented TEM work on air-sensitive Co/Al₂O₃ Fischer-Tropsch catalysts using an ex-situ sample holder. In their poster, Dr Alison Twitchett and colleagues from the University of Cambridge described an interesting system for performing 3-D holography and tomography during heating, electrical biasing and field emission experiments on nanoscale materials. Beverley Inkson and colleagues from Sheffield University showed images of super-sharp W tips of different shapes that they had prepared for nano-manipulation in FIB and TEM instruments.

After lunch, Professor Stephen Donnelly of the University of Salford gave the third Plenary lecture. Professor Donnelly gave an overview with examples of his work on ion-irradiated materials using in situ TEM; an area of great importance to the nuclear power and semiconductor industries. Video clips of bubbles growing in He-irradiated Si were shown as well as particularly impressive high resolution videos of Xe precipitates in Al in which the movement of plane defects through the Xe could be seen. In the first of the afternoon's contributed presentations, Iain Fielden presented still and video images of Austenite decomposition and the Pearlite transformation in steel using a novel high temperature SEM instrument developed at Sheffield Hallam University. There then followed two very different talks on carbon nanotubes. The first, from the University of Leeds, was presented by Zabeada Aslam and described the use of a miniature STM built within a conventional TEM sample holder. This was used to make Current-Voltage measurements on bundles of SWCNTs in the TEM whilst EELS analysis also showed changes in the carbon bonding in the SWCNTs as they were physical deformed using the STM. Asa Barber of Queen Mary College, University of London showed how a scanning probe technique had been used in conjunction with SEM to simultaneously measure adhesion forces and to image individual carbon nanotubes as they were pulled from a polymer matrix. In the final contribution of the day, Alan Brooker from Renishaw plc presented a system for performing Raman spectroscopy within a working SEM instrument. He presented many examples of how this technique could be applied in materials science, forensic science and life science.

Overall, the meeting was a great success. The presentations and the research work described were both of a very high standard and covered a broad range of techniques and applications. The number of attendees was high for such a one-day meeting and the number of questions to presenters as well as the energetic discussions during the breaks confirmed that this area is a growing and particularly active one. I would like to thank all those who attended, and especially those who presented their work, for making the meeting so stimulating and enjoyable.

R T Baker (University of St Andrews)

We are pleased to be able to announce that all of the Plenary and Invited speakers for the forthcoming EMAG 2007 conference have now been confirmed. They are as follows:-

Plenary Speakers:

Prof Christian Colliex

Université Paris Sud, Laboratoire de Physiques des Solides, Orsay, FRANCE

Exact Title TBA

Prof Michael M. J. Treacy

Department of Physics and Astronomy

Arizona State University

Tempe AZ, USA

"Glimpsing order within the disarray"

Prof John Chapman

Department of Physics and Astronomy

University of Glasgow, U.K.

Exact Title TBA

Invited Speakers:

Dr Kazuo Furuya

High-Voltage Electron Microscopy Station

Department of Materials Infrastructures

National Institute for Materials Science

Tsukuba, Japan

"Electron Beam Induced Fabrication and Characterization of Nanostructures"

Prof Eva Olsson

Chalmers University of Technology

Goteborg, Sweden

"Dynamic in-situ experiments using combined SPM and TEM".

Prof Wayne D. Kaplan

Dept. of Materials Engineering

Technion - Israel Institute of Technology

Haifa, Israel

"Energy, structure, and chemistry of nanometer-thick intergranular films at metal-ceramic interfaces".

Prof Alan Craven

Department of Physics and Astronomy

University of Glasgow

Glasgow, U.K.

"Oxides on semiconductors studied by EELS"

Prof Angus Kirkland

Oxford University
Department of Materials
Oxford, UK.

"Aberration corrected TEM: current status and future prospects"

Dr Frances Ross

Nanoscale Materials Analysis Department
IBM TJ Watson Research Center
Yorktown Heights, NY, USA

"Dynamic electron microscopy of the growth of nanowires and the structure of their catalysts"

Dr Martin Lee

Department of Geographical and Earth Sciences
University of Glasgow
Glasgow, UK

"Applications of FIB and TEM in the Earth and planetary sciences"

Prof Mike Finnis

Department of Materials
Imperial College, London.

"Atomistic modelling of strontium titanate grain boundaries"

Prof Marin van Heel

Wolfson Laboratories
Department of Biological Sciences
Imperial College, London

Exact Title TBA

Dr Edward D Boyes

DuPont Experimental Station,
Wilmington, Delaware, USA

"SEM in Surface Science"

MINUTES OF 2006 EMAG AGM HELD ON 30 JUNE 2006 AT THE
INSTITUTE OF PHYSICS

1. The minutes of the 2005 AGM (31/8/05 – University of Leeds) were accepted as a true record of the meeting
2. There were no matters arising from the Minutes
3. **Chairman's Report for the year 2005/6**

The 2005 conference of the Electron Microscopy & Analysis Group (EMAG) was co-hosted with the Nanoscale Physics and Technology (NPT) Group of the Institute of Physics and held at The University of Leeds from 31 August to 2 September. The conference attracted **151** delegates from **16** countries. As part of the "Einstein" International Year of Physics, the conference focused on the dominant themes of Imaging, Analysis and Fabrication on the Nanoscale. EMAG and NPT co-organised the scientific programme, allowing three parallel sessions to run:-

- (1) Microscopy techniques for nanotechnology;
- (2) Investigating structure-property relationships in advanced materials;
- (3) Nanophysics and nanotechnology.

In addition to the **4** plenary lectures, there were **13** invited oral presentations and **77** contributed oral papers that ran in three parallel sessions. Furthermore, **44** posters were presented throughout the three days

An Advanced School preceded the conference, with tutorial lectures on:

- Imaging in the Electron Microscope
- Analysis in the Electron Microscope
- STM and Nanostructured Surfaces
- Functionality of Nanoscale Solids

to help research students gain a wider appreciation of the keynote scientific issues and to provide a background to the detailed conference themes. Indeed, one of the motivations for running this conference series has been to encourage and develop the next generation of research scientists, to help maintain the UK's international profile in the areas of microscopy, analysis and innovation in micro- and nanotechnology. In this context, EMAG provided bursaries to cover the registration fees for **27** research students to help meet their costs of attending this event.

A student competition was run during the conference with prizes awarded for both oral and poster presentations, as follows:

Oral presentations

- 1st Prize: Edmund Ward (University of Cambridge). Talk entitled 'Nano-metrology of platinum-ruthenium bimetallic catalysts and the cluster-to-crystal transformation.'
- 2nd Prize: David Eustace (University of Glasgow). Talk entitled 'ELNES as a probe of magnetic structure in mixed oxides.'
- Honourable Mention: Aslam Zabeada (University of Leeds). Talk entitled 'Growth of carbon nanotubes from supported metal catalysts.'

Poster presentations

- 1st Prize: John Walker (University of Sheffield). Poster entitled 'Site specific SEM/FIB/TEM for analysis of lubricated sliding wear of aluminium alloy composites.'
- 2nd Prize: Lionel Cervera-Gontard (University of Cambridge). Poster entitled 'Linear delocalisation on nanoparticles.'
- Honourable Mention: Kirsten McLaughlin (University of Cambridge). Poster entitled 'The analysis of plastic and elastic deformation from indentation.'

A Trade Exhibition was fully integrated into the conference site in the University Sports Hall, within close walking distance of the lecture theatres, giving delegates the opportunity to discuss recent developments in analytical instrumentation. In keeping with the previous EMAG 2003 conference at Oxford University, provision was made for commercial workshops for the promotion of products by the manufacturers and 'question and answer' sessions. The companies on show spanned the range of mainstream electron and scanning probe instrument makers, combined with a broad spectrum of smaller companies providing ancillary equipment, from services for sample preparation to vacuum system support.

As ever, we are grateful to the exhibitors and sponsors for their valued contribution to this conference series.

The conference dinner was held in the War Gallery at the Royal Armouries museum

The Chairman thanked the many people who helped with the running of this conference:

- The local organising committee of Rik Brydson, Andy Brown, John Harrington and Andy Scott.
- Dave McComb and Bruce Hamilton for collating the scientific programme, to Stephen Donnelly for co-ordinating the award of student bursaries, and to Richard Baker and Bruce Hamilton for guiding the editing of the proceedings.
- The exceptional contribution of Jill Cowlard and Nicola Deedman of the CEM Group for co-ordinating the Trade Exhibition, and Claire Pantlin and Jasmina Bolfek-Radovani of the IoP
- A special thanks also to Jane Lowe of the IoP for her sterling work collating the proceedings.

The Chairman concluded with an invitation to attend the year 2007 conference in the EMAG series, to be held in Glasgow.

Paul D Brown, University of Nottingham (EMAG Chair)

4. Honorary Secretary's report for the year 2005/6

Committee meetings (number in attendance)

- 11/01/05 (15 - IoP, London); 11/05/05 (16 - IoP, London); 10/10/05 (13 - IoP, London); 05/01/06 (10 - IoP, London); 03/05/06 (11 - Glasgow Caledonian).

AGM

- 31/08/05 (~20 – University of Leeds)

EMAG sponsored meetings

- Microscopy of Catalysts – EMAG one day meeting, 27/04/05
- EMAG-Nano 05, University of Leeds, 31/08/05-02/09/05
- Condensed Matter and Materials Physics, 20-21/04/06, Exeter – EMAG sponsored Nanostructured Materials session (Nicole Grobert, University of Oxford, on 'High spatial resolution characterisation of carbon nanotubes').

- One day meeting on In-situ Electron Microscopy and Analysis, 30/06/06, IOP, London

Bursaries (2006 session)

- 4 conference bursaries have been awarded to Neil Young (University of Birmingham); Eireann Cosgriff (Trinity College Dublin); Craig Brownlie (University of Glasgow); Catriona McGilveray (University of Glasgow)

EMAG sponsored bursaries

Year	No. of ordinary bursaries	Cost	EMAG conference bursaries	Cost		Cost
2000	11	£2,750				
2001	7	£1,650	34 (Dundee)	£4,420		
2002	12	£2,000			7 ICEM bursaries joint RMS / EMAG	£2,100
2003	6	£1,000	29 (Oxford)	£3,190		
2004	2	£400			6	£ 440
2005			27(Leeds)	£3,770		£3,770

5. Honorary Treasurer's Financial Report

Year 2006				
	Bal b/f		-1345	
01/01/06	EMAG Group income		3,450	
	Total		2105	2105
	Printing / Newsletter			265
	Cttee expenses			650
	Organised conferences			0
	Grants/bursaries			500
30/04/06	Total		2105	1415
				690

Notes:-

- Credit for **£2131.87** from EMAG 2007 final accounts still awaited.
- Change to the IoP financing of groups due for the 06/07 session.

6. EMAG Committee Membership

- PDB retired from the role of EMAG Chairman but to be co-opted back onto the Committee as proceedings editor for the EMAG 2007 conference in Glasgow.
- Dave McComb stepped down at this time as Honorary Secretary / Treasurer to the group.
- The Committee have nominated Dave McComb as Chairman and Richard Baker as the Honorary Secretary / Treasurer

- Prof. Rik Brydson and Prof. Bruce Hamilton also stepped down as co-opted members at this stage. The Committee thanked Rik for hosting the very successful EMAG-NANO 2005 event in Leeds, and thanked Bruce for his work as proceedings co-editor. Dr Pauline Sillers has also stepped down from the Committee.
- In support of the EMAG 2007 event, Professor Michael Doughty (Glasgow Caledonian) and Dr Maureen MacKenzie (University of Glasgow) have been co-opted onto the committee. We also welcome Dr Gunter Moebus (University of Sheffield) onto the committee.
- **Dr Pete Nellist** (Trinity College Dublin / University of Oxford) was elected as an Ordinary Committee Member.
-
- **Rik Brydson** is also co-opted back onto the committee at this stage as EMS representative.

7. Future collaborations between EMAG and EMS

EMS is overseeing the arrangements for EMC 2008 to be held in Aachen and will be providing bursaries to help student attendance. Overall the EMS is expanding and the organisation is continuously improving and the help it can provide for European Microscopy meetings increasing. EMS is supporting the UK (RMS and EMAG) bid for IMC 2010 which will be voted on in September at IMC 2006 in Sapporo. 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).

8. SuperSTEM Facility

The SuperSTEM facility was renewed by EPSRC for a further five years as from February 2007. New research fellow posts arising from the new grant have just been advertised. We thank EMAG for its continued support of the facility. SuperSTEM will form part of the Royal Society Summer Exhibition in London in early July and in Glasgow in September. EMAG members are welcome to attend please see the Royal Society website for further details. The second SuperSTEM instrument is currently being constructed and tested and will be delivered in November 2006.

Rik Brydson, University of Leeds.

9. Any Other Business

There was no other business and the meeting closed at 17.30

Dr Richard Baker
Hon Secretary and Treasurer

FUTURE MEETINGS OF INTEREST

8-12 January, Arizona State University, Tempe, AZ, USA
2007 Winter School on High Resolution Electron Microscopy
(www.asu.edu/clas/csss/workshops/)

6 February, Loughborough University, UK (RMS event)
Microstructure of High Temperature Oxidation
(http://www.rms.org.uk/event_hightempox.shtml)

14 February, The Institute of Physics, London (IoP event)
Nanoelectronics - Materials and Technology
(<http://www.iop.org/Conferences/>)

25 February- 2 March, Chicago, IL, USA
PITTCON 2007 (www.pittcon.org)

26 – 27 March, University of Southampton, UK (IoP event)
Nanoscale Physics and Technology: the Interface with Medical and Biological Sciences (<http://www.iop.org/Conferences/>)

26-28 March, New Lanark Mill Hotel, Scotland (RMS event)
Electron Backscatter Diffraction Conference
(http://www.rms.org.uk/event_EBSD.shtml)

1-3 April, St Catherine's College, University of Oxford, UK (RMS event)
17th Interdisciplinary Research Conference on Biomaterials
(<http://www.griboi.org/>)

2-5 April, University of Cambridge, UK (IoP and RMS event)
15th International Conference on Microscopy of Semiconducting Materials
(<http://conferences.iop.org/MSMXV>)

9-13 April, San Francisco, CA, USA
2007 MRS Spring Meeting (http://www.mrs.org/s_mrs/)

10-12 April, Monterey, California, USA
SCANNING 2007 (<http://www.scanning.org/>)

11-13 April, University of Leicester, UK
Condensed Matter and Materials Physics
(http://www.iop.org/Conferences/Forthcoming_Institute_Conferences)

23-27 April, University of Surrey, Guildford, UK
Surface Analysis: An Introduction to XPS, Scanning Auger Microscopy and Secondary Ion Mass Spectrometry (D.Saunders@surrey.ac.uk)

23-27 April, University of Birmingham, UK (RMS event)
Spring School in Electron Microscopy (http://www.rms.org.uk/event_em07.shtml)

FUTURE MEETINGS OF INTEREST

20-24 May, Santa Clara Convention Center, Santa Clara, CA, USA

2007 NSTI Nanotechnology Conference and Trade Show

(www.nsti.org/Nanotech2007/)

3-15 June, Lehigh University, Bethlehem, PA, USA.

Lehigh Microscopy School (www.lehigh.edu/microscopy)

5-8 June, Grenoble, France

Societe Francaise des Microscopies Meeting (<http://sfmu.free.fr>)

12-16 June, **University of Alberta, Edmonton, Canada**

MSC/SMC 2007 34th Annual Meeting of Microscopical Society of Canada

(www.phys.ualberta.ca/MSC-2007/)

17-21 June, Prague, Czech Republic

8th Multinational Congress on Microscopy (<http://nucleus.biomed.cas.cz/8mcm>)

17 June–2 July, University of British Columbia, Vancouver, Canada

12th International Short Course on 3D Microscopy of Living Cells, 9th

Workshop on 3D Image Processing (www.3dcourse.ubc.ca)

20 June, Institute of Physics, London, UK (IoP event)

Plasmas Surfaces and Thin Films

20 June, Williams Formula 1 Centre, Wantage, Oxfordshire, UK

MICROSCIENCE Technology Forum – Microscopy in the Aerospace and

Automotive Industries (http://www.rms.org.uk/event_aeroauto.shtml)

6-9 August, Ft Lauderdale, CA, USA

Microscopy & Microanalysis-2007 (<http://microscopy.org/MMMeetings/MM07/>)

2-7 September, Saarbrücken, Germany

Deutsche Gesellschaft fur Electroenenmikroskopie (www.dge-homepage.de)

3-7 September, Glasgow Caledonian University (IoP event)

EMAG 2007 (dawn.stewart@iop.org ; <http://www.iop.org/Conferences/>)

17-20 September, Detroit, USA

The American Ceramic Society (<http://www.ceramics.org/>)

26-30 November, Boston, MA, USA

2007 MRS Fall Meeting (http://www.mrs.org/s_mrs/)

8-11 June 2008, Cracow-Zakopane, Poland

EM2008: 8th International Conference on Electron Microscopy of Solids

(kusinski@uci.agh.edu.pl)

ELECTRON MICROSCOPY AND ANALYSIS GROUP

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<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
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SIGNATURE		DATE	
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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, Cockcroft Building (Room 105 Salford University, Manchester, M5 4WT, UK (Email: S.E.Donnelly@salford.ac.uk)