

*Unique Nanorod Defects in Nd and Ti co-doped BiFeO<sub>3</sub>  
(image recorded at SuperSTEM by Dr Bernhard Schaffer,  
working with Dr Ian MacLaren and Prof Ian M. Reaney)*

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Dr Roland Kröger

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Dr Peter O'Toole

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## A LETTER FROM THE CHAIR

Dear friends and colleagues,

This will be my last letter to you as the Chair of EMAG, as the convention requires that I retire at the upcoming AGM on 20 July. I would therefore like to say how enjoyable it has been to be at the EMAG helm for these last two years. The enjoyment has arisen predominantly from the chance that being Chair has given me to interact with EMAG members. In particular it has been an absolute pleasure working with the committee members, both elected and co-opted, that were so committed to delivering EMAG business, and in particular the EMAG2011 conference at the University of Birmingham. I am very excited at the plans in place for the EMAG2013 conference at York, and I am already looking forward to it.

I am delighted with the number of abstracts submitted for the EMAG one-day meeting on 20 July on the topic of Quantitative Interpretation of TEM Imaging and Diffraction data, and I look forward to seeing many of you there. Having read the abstracts, we clearly have a very interesting day ahead of us. I also look forward to seeing many of you at the EMC 2012 conference in Manchester. It is wonderful that this is being hosted in the UK this year.

You will be glad to know that the EMAG2011 proceedings will be appearing online very shortly. All the papers have been uploaded to the Journal of Physics: Conference Series site, and will go public after I have had chance to iron some minor issues.

Finally, I would also like to remind members that the EMAG committee is also able to support student attendance at non-IOP conferences via the IOP Research Student Conference Fund. Information on applying for these bursaries can be found later in this newsletter.

It is an exciting time for electron microscopy in the UK, with some new facilities being officially opened over the next month and some exciting EM projects being recently funded. I would like to wish my successor all the best as Chair, and I look forward to continuing to support the activities of EMAG going forward from the "back benches".

With all best wishes,

Pete Nellist

## EMAG ANNUAL GENERAL MEETING

The AGM of the EMAG group will this year be held in Oxford on Friday 20<sup>th</sup> July at 4 pm, alongside the 1-day meeting advertised below. A separate agenda is circulated with this newsletter, and one major item of business will be the election of a new Chair and a new Secretary / Treasurer of the group. Nominations can be submitted on the enclosed nomination form.

## 1-DAY MEETING “QUANTITATIVE INTERPRETATION OF TEM IMAGING AND DIFFRACTION DATA” AND MIKE WHELAN CELEBRATION

As you should have seen advertised separately, there will be a one-day meeting in Oxford on Quantitative Interpretation of TEM Imaging and Diffraction Data. This is part of a celebration of the 80<sup>th</sup> birthday of Prof. Mike Whelan, who was one of the pioneers in the quantitative interpretation of TEM images and diffraction patterns. In recent years, this field has received a major boost from the high quality data coming from new aberration-corrected microscopes, new detectors and spectrometers, and the interaction with the atomistic simulation community. The meeting promises to be an exciting one with 4 invited talks by Prof. Paul Midgley, Prof. John Rodenburg, Dr Sandra Van Aert, and Prof. Angus Kirkland, together with 8 contributed talks and a good number of posters.

To register for this meeting, please go to:

<https://www.eventsforce.net/iop/frontend/reg/thome.csp?pageID=112381&eventID=276&eventID=276>

After the conclusion of the meeting and the EMAG AGM, there will be further talks by Mike Whelan's former colleagues Prof. Archie Howie and Prof. Peter Hirsch and a drinks reception and dinner in Linacre College, Oxford with an after-dinner talk by Prof. Colin Humphreys. Accommodation will also be available in Keble College for those who wish to stay overnight after the dinner.

For registration for the evening meeting and dinner, and also for accommodation, please go to:

<http://www.oxforduniversitystores.co.uk/browse/product.asp?catid=1490&modid=1&compid=1>

## “APPLICATIONS OF PRECESSION ELECTRON DIFFRACTION” SUMMER SCHOOL

- **Do you want to know how to get higher resolution, more interpretable electron diffraction data?**
- **Do you want to know what tools are available to help with interpreting diffraction data?**
- **Do you want to know how to improve the spatial resolution of your Electron Backscatter Diffraction (EBSD) orientation data (using a TEM)?**

Come to our 2 day advanced school on “Applications of Precession Electron Diffraction” which is organised as a satellite event to EMC2012 in Manchester on 14<sup>th</sup>-15<sup>th</sup> September. You will get the opportunity to have hands-on, small group experience of new TEM diffraction techniques, including the opportunity to try the techniques on your own samples (subject to demand). You will be taught by world experts in electron crystallography and can try out different software packages. This is the first dedicated school of its type to be held in the UK so we encourage you to come and learn how you could benefit from these new techniques which have many applications including nanoparticles, metallurgy, ceramics, etc..

**A limited number of travel/accommodation bursaries are available to support students** – first come first served – please email us.

There will be lectures on applying the technique to conventional crystallographic research and its impact on advanced crystallographic techniques including automated diffraction tomography for three dimensional structural analysis and the EBSD-like scanning diffraction analysis for texture and phase mapping in the TEM. Our main aim is to provide direct advice and experience for the attendees, to help them to achieve their own research goals. Information about the lectures and practical classes can be found on our webpage:

[http://www-hrem.msm.cam.ac.uk/events/Precession\\_Meeting/main.xhtml](http://www-hrem.msm.cam.ac.uk/events/Precession_Meeting/main.xhtml)

The meeting will run concurrently with the SuperSTEM summer school at the Manchester Materials Centre, with coordinated breaks, meals and social events. This is therefore a great opportunity to network with researchers both within the crystallography field and among a wide range of other microscopy fields.

We thank the RMS, EMS, IUCr, Nanomegas, and Calidris for generous support. Please contact Alex Eggeman ([ase25@cam.ac.uk](mailto:ase25@cam.ac.uk)) or Sarah Haigh ([sarah.haigh@manchester.ac.uk](mailto:sarah.haigh@manchester.ac.uk)) for more information.

Organising committee:

Dr Alex Eggeman, Prof Paul Midgley (University of Cambridge), Dr Sarah Haigh (University of Manchester), Prof Laurie Marks (Northwestern University), Dr Stavros Nicolopoulos (NanoMEGAS SPRL).

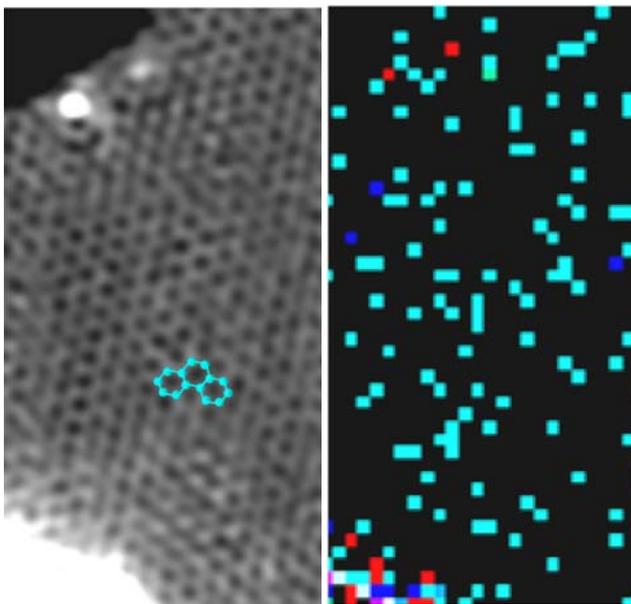
## 5<sup>th</sup> SUPERSTEM SUMMER SCHOOL ON ABERRATION CORRECTED STEM

There are still some limited places left at the 5<sup>th</sup> SuperSTEM summer school on Aberration Corrected STEM, 14-16<sup>th</sup> September 2012 in Manchester, prior to EMC2012. See the link <http://www.superstem.org/events/summerschool2012> for further details.

## NEW WORLD-CLASS MICROSCOPE AT MANCHESTER

The School of Materials at the University of Manchester has a new addition to its Electron Microscopy Centre (EMC), a Titan™ G2 80-200 ChemiSTEM (FEI, Hillsboro, OR, USA) with high-efficiency energy dispersive X-ray (EDX) detectors, the first to be installed in a UK university. This high-resolution analytical (scanning) transmission electron microscope has an aberration corrector in the probe-forming optics and delivers sub-Å resolution in STEM mode HAADF images. This consequently leads to atomic-level resolution imaging and chemical analysis. The advanced 4-detector architecture together with the bright, focussed electron probe provides a dramatic increase in EDX spectra acquisition speed with near single-atom sensitivity in elemental analysis, also permitting EDX imaging tomography performed in STEM mode for the first time.

*On the left is a high angle annular dark field image of graphene taken in a Titan™ G2 80-200 ChemiSTEM at 80 keV . It clearly shows the graphene honeycomb lattice, as well as titanium atoms (white 'blobs' near the layer edge; top left) and clusters thereof (bottom left); titanium was deposited onto the graphene for purposes of electrical contacting studies. The EDX map of this area is shown in the right-hand image and was obtained with a SuperX detector. Turquoise dots are carbon, and although by far not every carbon atom in the graphene sheet is detected, this 'speckled' EDX map is an unprecedented result considering it was*



*obtained of a single atomic layer within a couple of minutes! Titanium atoms (red) are detected, too; most importantly, their distribution correlates with that in the high angle dark field image on the left, in spite of the fact that image and EDX map were obtained sequentially, and titanium atoms are extremely mobile on graphene. Presence of oxygen (blue) could also be proven- to get such direct evidence was near-impossible so far. Electron beam radiation sensitivity and high ad-atom mobility in graphene make low voltage operation of the ChemiSTEM and high efficiency EDX detection for short-time acquisition indispensable tools.*

*Acknowledgement: Anna Carlsson, FEI*

The Titan ChemiSTEM was funded through government investment at Manchester's Dalton Nuclear Institute, driven by nuclear materials research applications to strengthen the research capability of the Nuclear Advanced Manufacturing Research Centre. The additional possibility to operate the ChemiSTEM at voltages down to 80 keV has advantages for research on graphene and other 2-D materials, an area in which the School is highly active. The microscope will also play a large part in a newly established, FEI-supported Centre of Correlative Imaging at Manchester, whose mission is the characterisation of materials in three dimensions over a broad range of length scales, from centimeters to nanometers, employing a number of imaging techniques, from X-ray tomography for large-scale to transmission electron microscopy for atomic-scale assessment.

## MAGTEM OPENING AT GLASGOW

The installation of the JEOL ARM200F at Glasgow has been proceeding well through the spring and the installation was officially accepted by the University of Glasgow on 30<sup>th</sup> March 2012, although some further work on system optimisation is continuing. The official opening and launch meeting will be held on 2<sup>nd</sup> July 2012 with the opening to be performed by Dr Alasdair Allan, Scottish Government Minister for Learning, Science and Scotland's Languages, together with the Principal of the University of Glasgow, Prof. Anton Muscatelli. Invited talks will be given by Prof. Sir Colin Humphreys of the University of Cambridge and Prof. Christian Colliex of . An afternoon scientific session will also be held with contributions from industrial partners, and academic collaborators in SUPA (Scottish Universities Physics Alliance) and elsewhere.



## SUPERSTEM UPDATE

The SuperSTEM Consortium has secured additional Capital Funding from EPSRC of approximately £1.1M, which together with contributions from the five Consortium Universities and a manufacturer, as well as the SuperSTEM Facility itself, will enable the purchase of a brand new monochromated, chromatic and spherical aberration corrected STEM column (SuperSTEM III), rather than the original planned instrument upgrade to SuperSTEM II. The new machine is currently being ordered and is hoped to be in place for the end of 2013. The machine will form part of the new National Facility for Aberration-corrected Scanning Transmission Electron Microscopy and will provide free state-of-the-art access for EPSRC eligible users. See <http://www.superstem.org> for further details. A further staff scientist post to support the new machine will be advertised shortly.

The National Facility Key Performance Indicators for the first 6 months of operation are now available on the SuperSTEM website at <http://www.superstem.org/facilities/indicators>

## EMS MEMBERSHIP

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:

[secr@eurmicsoc.org](mailto:secr@eurmicsoc.org)

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. D. Schryvers).

The EMS web page can be viewed at: <http://www.eurmicsoc.org/>

EMAG members are also reminded of the availability of EMS Bursaries. For more details, see

<http://www.eurmicsoc.org/scholarships.htm>

## RESEARCH STUDENTS CONFERENCE FUND

If you are a student member and want help with going to a meeting or conference, please apply for an RSCF bursary, which may give you up to £250 towards your costs. We have several of these bursaries to give away each year.



**Supporting research students**

### Research Student Conference Fund

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

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

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

For further information see [www.iop.org](http://www.iop.org) or contact [supportandgrants@iop.org](mailto:supportandgrants@iop.org)

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## MEETING REPORTS

### **PICO 2012**

Forschungszentrum Jülich, Germany  
29<sup>th</sup> February – 2<sup>nd</sup> March 2012

Ian MacLaren, University of Glasgow

The PICO 2012 meeting was held in Jülich to celebrate both the inauguration of their latest microscope, a probe and image corrected FEI TEM/STEM, set in a specially designed extension to the Ernst Ruska-Centre, as well as the 70<sup>th</sup> birthday of Prof. Knut Urban. Having used the facilities at the ER-C in the past, and having collaborated with some of their staff, I thought it might be nice if I went. As it turns out, I was not the only one and more than 300 people tried to pack into their lecture theatre for the opening ceremony! The meeting turned out to be an excellent meeting, with invited speakers from all over the world representing a very good snapshot of many of the exciting directions in electron microscopy just now. The social times were also very good, with nice lunches in the new Ernst-Ruska extension, with a possibility to view the new microscope and the other facilities, and here was also an excellent conference dinner in an old castle a few miles outside Jülich. So in addition to the fantastic scientific content in the lectures, it was also a great opportunity for scientific discussion, meeting fellow microscopists from across the world, and catching up with old colleagues and former students.

## FUTURE MEETINGS OF INTEREST

EBSD 2012, March 26-28, 2012, NPL, London, UK

1-day meeting on “Quantification of TEM Image and Diffraction Data” and a celebration of Prof. Mike Whelan’s 80<sup>th</sup> Birthday, July 20, 2012, Linacre College, Oxford, UK

M&M 2012, July 29 – August 2, 2012, Phoenix, Arizona, USA

Precession electron diffraction school, September 14-15, 2012, Manchester, UK

5<sup>th</sup> SuperSTEM School in aberration corrected analytical TEM, September 13-16, 2012, Manchester, UK

EMC2012, September 16-21, 2012, Manchester, UK

<http://www.emc2012.org.uk/>

EMAG2013, September 3-6, 2013, University of York, UK

## EMAG contact points

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Email: [conferences@iop.org](mailto:conferences@iop.org)

<http://www.iop.org/events/scientific/conferences/index.html>

Group matters: Science Support Officer

Email: [groups@iop.org](mailto:groups@iop.org)

EMS: European Microscopy Society

Email: [secr@eurmicsoc.org](mailto:secr@eurmicsoc.org)

<http://www.eurmicsoc.org/index.html>

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, 12100 Sunset Hills Rd., Suite 130,  
Reston, VA 20190, USA.

Tel: +1 703 234 4115, Fax: +1 703 435 4390

<http://www.microscopy.org/>

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](mailto:meetings@rms.org.uk) <http://www.rms.org.uk/events/>

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This newsletter is also available on the web and in larger print sizes

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