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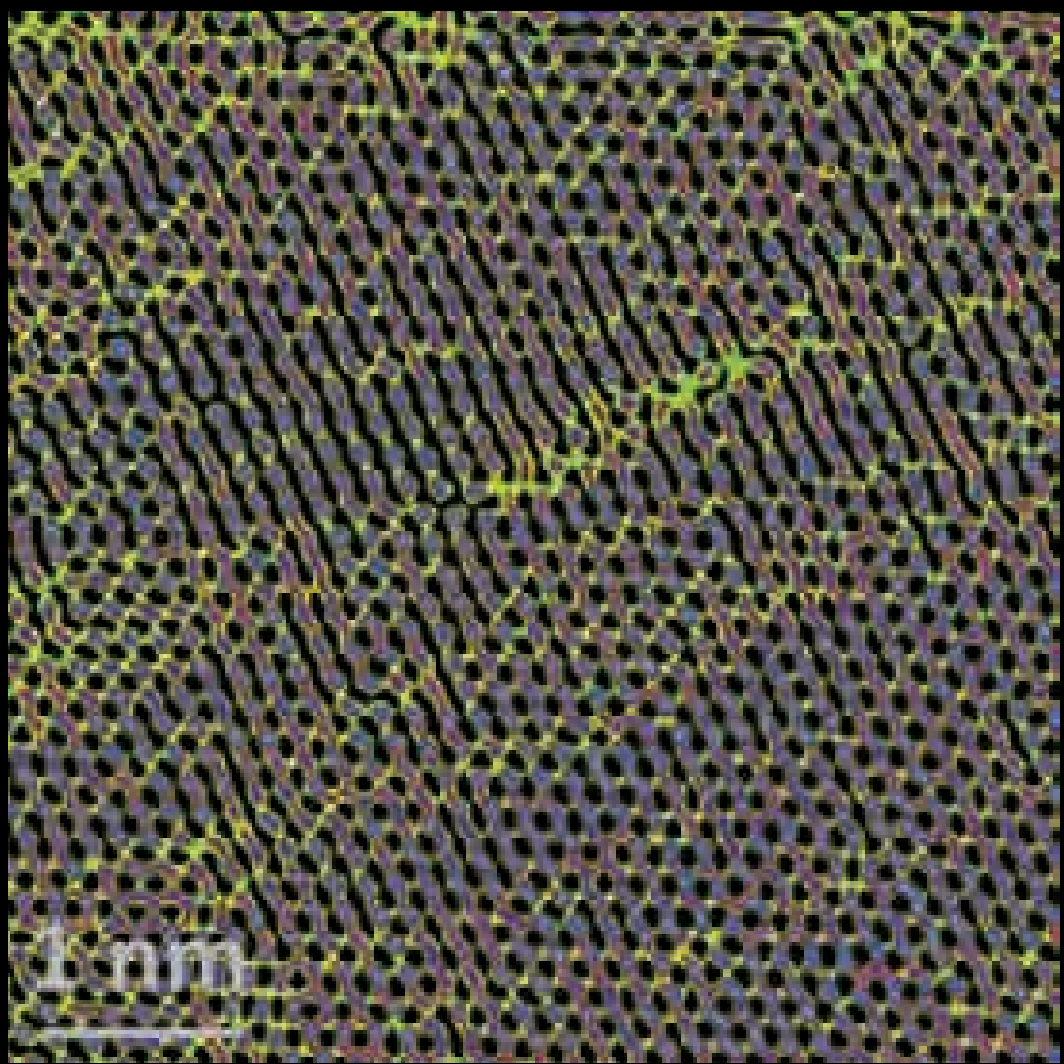

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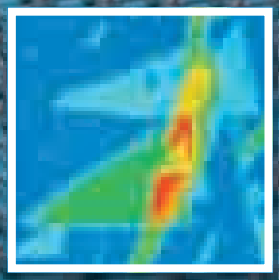
The same graphene flake imaged by different AFM and spectroscopy techniques in the single experiment



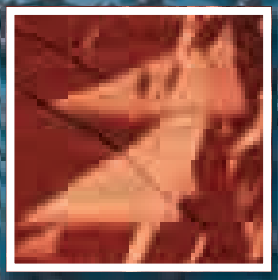
Raman map: G-band intensity

Raman map: 2D (G') band mass center

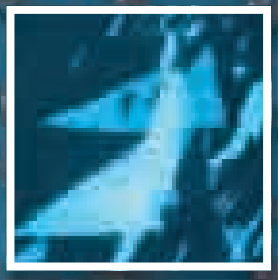
Rayleigh light intensity

AFM: Height

AFM: Lateral force

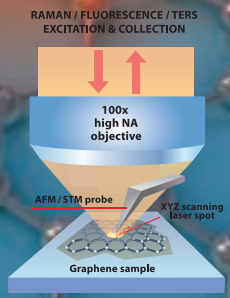


AFM: Force modulation



AFM: Kelvin probe

AFM: Electrostatic force



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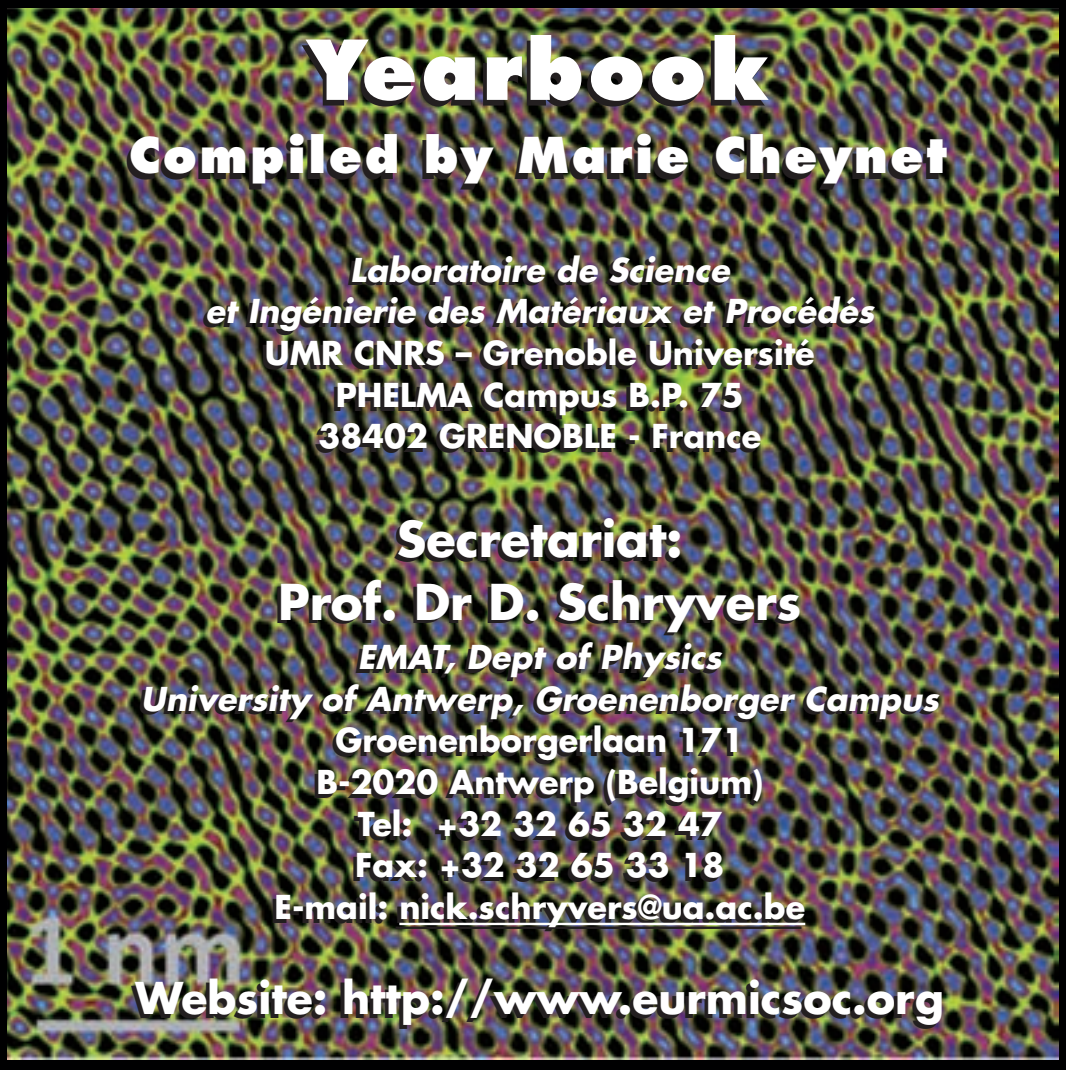

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Preface

Since its creation, the European Microscopy Society (EMS) has been at the forefront of research and development in microscopy. EMS has grown steadily in terms of its membership and its activities to provide increasing support to microscopists. Every year, a short summary of EMS highlights is written and distributed to each member. Starting last year, the Yearbook, originally created by Peter Hawkes and Eddie Wisse to report the current membership list, displayed a new look.
I have heard that this new version has been appreciated. Thank you very much to all those who have expressed support and encouraged us to continue with this revision and renovation in presentation. I also hope that those who miss the old version will understand the need to condense and focus content to items pertaining to EMS society life. The EMS members list will always be available on-line at the EMS website http://www.eurmissoc.org/database.htm.
As in the Yearbook 2010, you will find the same headings (i.e., EMS extensions, EMS sponsored events, EMS special events, Scholarships, Budget, …). For each of these items, the associated activities which have taken place throughout 2011 are reported.

As usual, EMS has supported two multi-national conferences as EMS Extension: MC 2011 in Kiel and MCM2011 in Urbino. Both were very successful, with nearly one thousand delegates in Kiel and four hundred in Urbino. The notes from lectures given by EMS-sponsored invited speakers during these conferences, as well as reports on the work presented by students who were supported by EMS scholarships are recorded.

In addition to these major events, EMS has also provided financial assistance to eight other European meetings organized in different countries (Italy, Israel, Switzerland, Poland, UK, Ireland and France). For each one, EMS has covered part of the costs for two invited lecturers. At both extensions and sponsored meetings, EMS has supported 23 scholarships (250 € each) and 14 invited speakers (750 € each).
What is new in 2011 is the item reporting on the annual EMS "Outstanding Paper Award". The EMS Executive Board has instigated this prize of 3000 € in total to honour and promote the best paper published during the previous year, in each of the following microscopy categories: i) Instrumentation and Technique Development, (ii) Materials Sciences, and (iii) Life Sciences. A check of 1000 € per awarded paper, a plaque for the first author in each category and printed awards for all authors were given to the winners during the congress dinners at the EMS Extensions.

Again it is good to see that the EMS membership has increased in 2011. This reflects the remarkable developments in microscopy that have been occuring across Europe in these last few years. Most of the European platforms or individual laboratories are now equiped with high performance microscopes, maintaining a dynamic work environment in our community.

Unfortunately as in 2010, 2011 has been marked by the death of two of our famous colleagues: Noël Bonnet working at the University of Reims and Jany Thibault working at the University of Marseille. Both were internationally recognized and have left a strong tribute to microscopy on Multivariate Statistical Analysis and High-Resolution TEM imaging respectively. Their death has deeply saddened the international community and particularly, the French one.

In the coming year, the main event will be emc2012 in Manchester (www.emc2012.org.uk) hosted by the RMS and EMAG societies. I invite you to look at the program and note the deadline for abstract submission - 16th March 2012, and of course all of the EMS board will be pleased to meet you in Manchester, 16 - 21 September.

Since I am nearing retirement, my EMS board member mandate will be ending at the GA 2012. I would like to take the opportunity of this preface to formally acknowledge all of my colleagues on the board and say that it has been a pleasure to work with them during these past eight years. I sincerely hope that the EMS will continue to support microscopy in Europe and promote it for a long time.

I cannot end this introduction without thanking all the companies who advertise in our Yearbook to support it and the ERI/SCE company, which ensures the Yearbook layout, free of charge for our society, since it was first published.

Marie Cheynet

COVER : **Spatial frequency filtered HAADF image to show ripples in suspended graphene. Black 'beads' are the centres of 'benzene' rings.** The bead-strings gave a separation of 0.21 nm, the colour coding is chosen so that the atoms on tops and in throughs of ripples appear yellow and in the flanks bluish. The ripple amplitude is ~0.5 nm and their 'wavelength' ~5 nm. Paper published in Physica Statis Solidi 1 206, n°6, 1117-1122 (2009)

Manifestation of ripples in free-standing graphene in lattice images obtained in an aberration-corrected scanning transmission electron microscope
U. Bangert[1], M. H. Gass[2], A. L. Bleloch[2], R. R. Nair[1,3], and A. K. Geim[3]
[1] School of Materials, University of Manchester, Manchester, M13 9PL, UK
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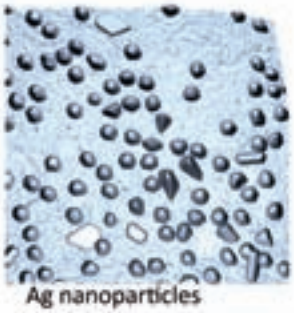
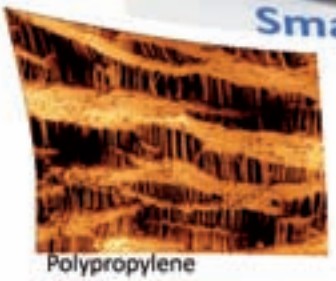
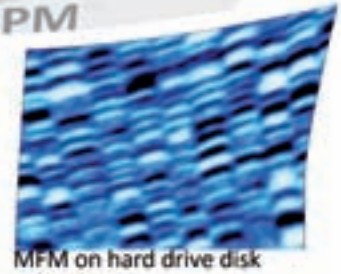


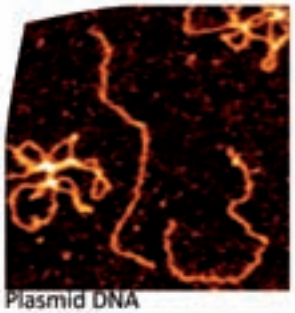
Ag nanoparticles
3.6×3.6 µm



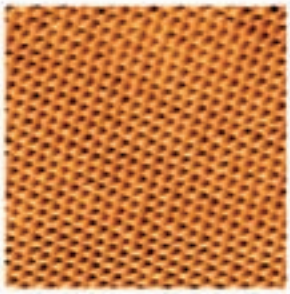
Polypropylene
2x2 µm



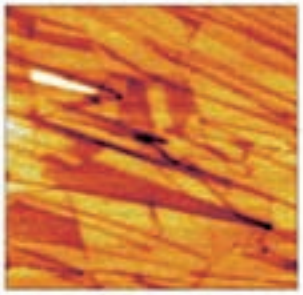
MFM on hard drive disk
1,8x1,8 µm



Plasmid DNA
300x300 nm

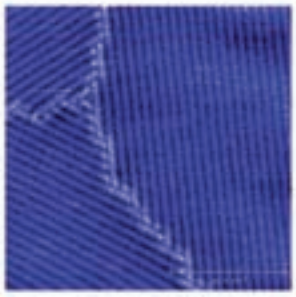


Atomic lattice of HOPG
32x32 angstroms



Kelvin Probe Microscopy on HOPG
6x6 µm

Lithography on GaAs film
3x3 µm



Alcane layer $C_{28}H_{58}$
100x100 nm

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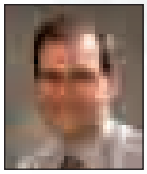

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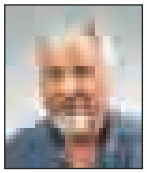

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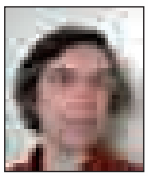

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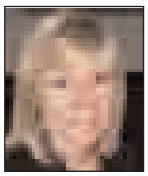

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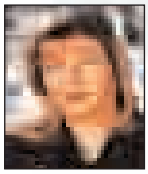

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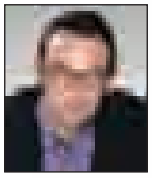

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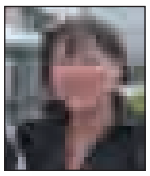

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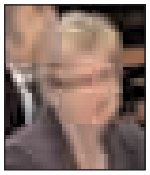

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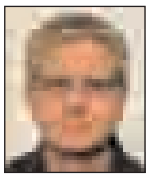

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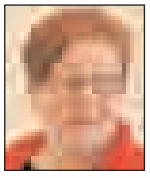

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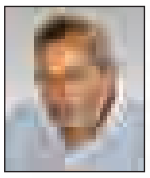

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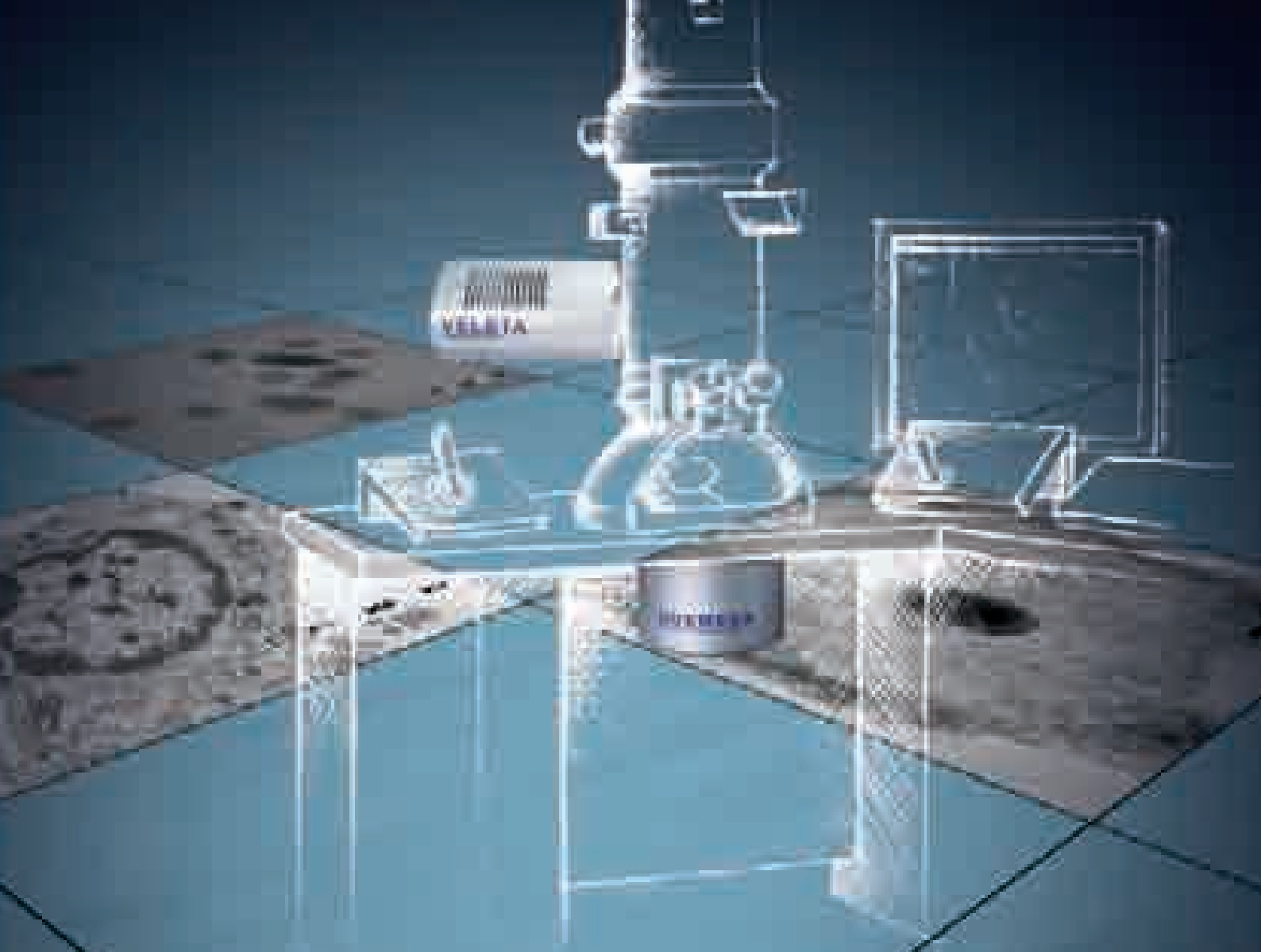

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FROM THE PRESIDENT...AND THE SECRETARY

Dear EMS member,

It is with great pleasure that we introduce this second issue of the new style EMS Yearbook . As last year, the Yearbook contains reports from those awarded EMS scholarships, reports from EMS Extensions and EMS sponsored events, as well as special microscopy events throughout Europe.

One of the most visible new initiatives of the EMS in the past year was the organization of the EMS Outstanding Paper Award. Nominations of papers published in 2010 were solicited and a jury selected 3 winners in the spring of 2011, one in each of the classic themes in microscopy. The awards were presented during the congress dinners of the EMS Extensions in Kiel and Urbino and on page 66 you can find a more detailed report on this item.

In the course of 2011 the preparations for the European Microscopy Congress, emc2012, organized by the RMS under the auspices of IFSM, have increased steadily. Over the summer the programme structure has been finalized, plenary speakers have been nominated and contacted, names of chairpersons have been filled in and by October-November nearly all invited speakers had received their invitation letter. On page 67 a more detailed report of these actions is presented.

In the mean time EMS continues to sponsor many European meetings in different ways. In 2011 two multi-national congresses were again selected as EMS Extensions: MC2011 in Kiel, Germany, and MCM2011 in Urbino, Italy. In this Yearbook you will find detailed reports on these meetings as well as lecture notes of some of the presentations sponsored by EMS. Aside from the large EMS Extensions, EMS has financially supported 8 meetings dedicated to microscopy or with an important microscopy component. The list is given on page 15 and some short reports of these meetings can also be found in this Yearbook.

The selected reports from young researchers who have received EMS scholarships, and which are presented on pages 57 to 64 this year, focus on attendees to the EMS Extensions plus one dedicated scholarship. These reports again clearly show the enthusiasm of these young microscopists for scientific research in our ever-growing field. This year, EMS has provided 9 scholarships for MC2011, 14 for MCM2011 and 1 for attending the Electron Microscopy Summer School in Leeds, each worth 250 €.

In 2010 the EMS membership stabilized at around 5644 members, with 48 corporate members, the former an increase of nearly 200 members, the latter an increase of over 14%! Although we still encourage microscopists in Europe to become members via a national or regional society, increasing numbers of researchers now opt for the possibility to become direct individual member to EMS.

If we look ahead to next year, and perhaps even further, it seems the economic situation in Europe is unlikely to improve significantly. However, despite the financial pressure on European education and research bodies, we are convinced that European microscopy will continue to reveal ever new and exciting science and we will continue to be amazed by the microscopic world. As always, EMS will continue to support and assist its members, especially its more junior members, in all the ways we can. We especially look forward to our European Microscopy Congress, emc2012, in Manchester from September 16 to 21 and we are eager to meet the European microscopy community at large at this quadrennial celebration of all aspects of microscopy.

Yours sincerely,

Paul Midgley
President EMS

Nick Schryvers
Secretary EMS

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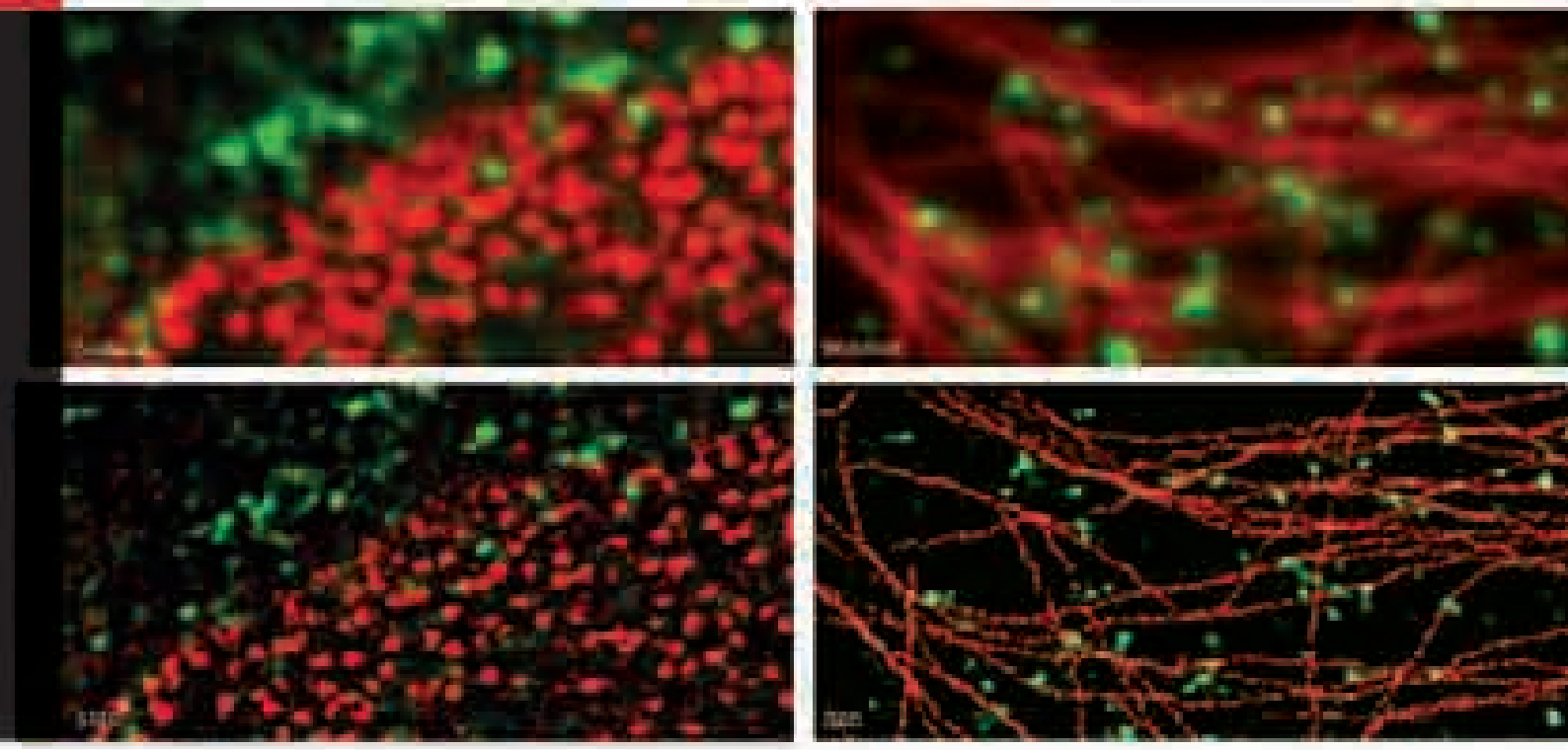

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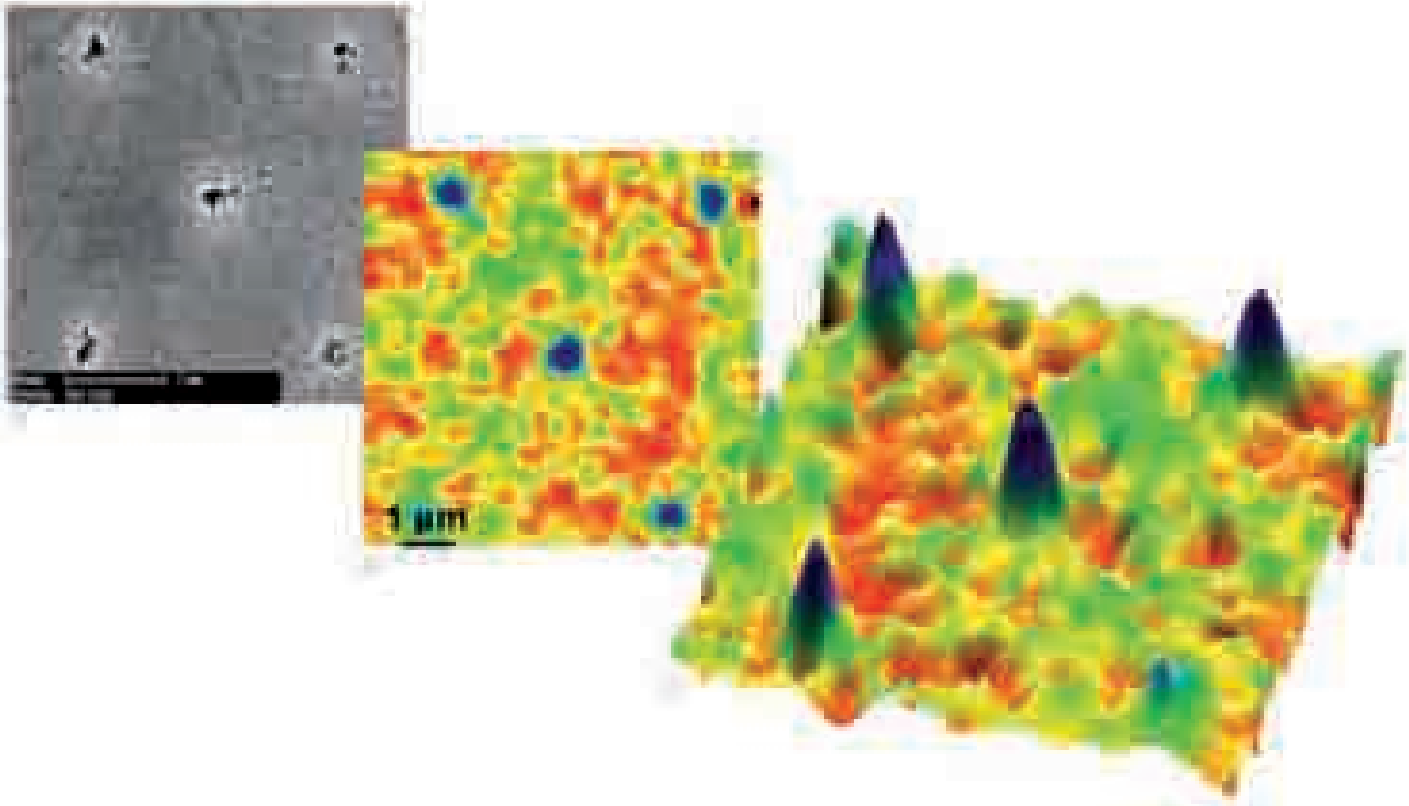

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Microscopy Conference MC 2011,

28 August – 02 September 2011 • Kiel, Germany

Scientists and manufacturers from all over the world met in Kiel for 6 days, from August 28th to September 2nd, 2011, during the international Microscopy Conference 2011 and shared a week of lively exchange about the latest developments in Instrumentation and Methods and current topics in Materials Science and Life Science.

930 participants, among those 140 student participants, attended the conference at the Christian-Albrechts-Universität zu Kiel, one of the leading universities in Germany. The congress, chaired by Wolfgang Jäger (Kiel), was the 35th in the series of electron microscopy conferences organized by the German Society for Electron Microscopy (DGE) and, for the first time, in collaboration with the European Microscopy Society (EMS), the Nordic Microscopy Society (SCANDEM), the Polish Microscopy Society (PTMi), scientists from research institutions in Estonia, Latvia, Lithuania, and St. Petersburg, Russia, with the support by Conventus Congressmanagement & Marketing GmbH.

More than 500 scientific contributions were received from 44 countries within as well as from outside Europe, including Japan, China, Israel, South Africa, USA, and others. The scientific program, designed by an international panel of distinguished scientists, focused on electron microscopy and related methods and covered with more than 25 scientific symposia and workshops the current developments in Instrumentation and Methods, Materials Science and Life Sciences. Numerous excellent contributions by scientists from universities, research institutions, and industry demonstrated convincingly the importance of electron microscopy methods and related methods in topical materials research and life sciences, in applications dedicated to the development of new materials, and for the advanced analysis of materials in current areas of technology. Several workshops focused on advanced methods and recent developments in Cryo SEM/FIB, in Programming for Data Acquisition, in the Local assessment of magnetic and electrical inner fields in the TEM, and in Image simulation for TEM and STEM. Please consult the conference homepage www.mc2011.de for more details.

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The broad spectrum of topical areas was reflected in parts by the opening lecture and the invited plenary talks of internationally leading scientists with their excellent contributions: 'Is there a need for further instrumental development?' (Maximilian Haider, Heidelberg, opening lecture), 'Structure determination of dynamic macromolecular complexes by single particle cryo-electron microscopy' (Holger Stark, Göttingen, EMS lecture), 'Understanding deformation mechanisms in nanoscale metals using in-situ electron microscopy' (Cynthia Volkert, Göttingen), 'Imaging systems for systems imaging in biology' (Heinrich Hohenberg, Hamburg), 'New techniques and instrumentation for the characterisation of magnetic and electrostatic fields in nanocrystals and working devices' (Rafal E. Dunin-Borkowski, Copenhagen-Lyngby and Jülich), 'Non-destructive 3D orientation maps of polycrystals on scales from 1 nm and 1 mm using transmission electron microscopy and 3D X-ray diffraction' (Henning F. Poulsen, Risoe), 'The physics and chemistry of nano-carbons explored by high-resolution electron microscopy' (Jannik C. Meyer, Vienna, EMS lecture).

Following the opening ceremony with numerous guests of honour and conference participants, the 2011 laureates of the Ernst Ruska Prize, Johan Verbeeck (Physicist from Antwerp) and David Mastronarde (Cell Biologist from Boulder, Colorado USA) were awarded this prestigious prize, named after the Nobel Prize Laureate Ernst Ruska, for outstanding contributions in electron microscopy of materials science and life sciences. The lectures of the awardees, titled 'Electrons with a twist: topological charge effects in a TEM' and 'Software tools for tomographic reconstruction of large volumes', gave excellent insight into the methods and their importance in research for materials and life.

A number of further events and highlights contributed substantially to the success of this conference. The commercial exhibition, bringing together 50 manufacturers of microscopes and suppliers of equipment and products in all fields of microscopy and related techniques, a technical session, and many lunchtime sessions provided ample opportunity for exchange of information. In a special session about 'Funding Strategies in Germany', Dr. Burkhard Jahnen (DFG German Science Foundation) and Dr. Franz Dettenwanger (Volkswagen Foundation) gave valuable insights into current research funding opportunities. The Conference Dinner Event featured the awarding of several MC2011 prizes and the greetings of the presidents and representatives of the microscopy societies (Annette Gunnaes, Oslo: SCANDEM; Aleksandra Czyrska-Filemonowicz, Cracow: PTMi; Dominique Schryvers, Antwerp: EMS; C. Barry Carter, Storrs, USA: International Federation of Societies for Microscopy IFSM; and Debbie Stokes, Cambridge UK: Chair of emc2012 Manchester). Several MC2011 Best Poster Prizes were awarded to young graduate scientists for their outstanding research presentations, three 'MC2011 Outstanding Micrograph' prizes were selected from the MC2011 Best Image Contest 'Art in Science', and an EMS Outstanding Paper Award 2011 was presented to Johan Verbeeck (Antwerp Belgium).

Scientific exchange at its best:
one of the numerous poster sessions of the MC2011.

Not only the scientific program, the special sessions and the commercial exhibition received highest estimation but also the offers for social activities were considered outstanding. We are grateful to all colleagues and participants for their invaluable support in making the Microscopy Conference MC2011 in Kiel such a great success, and we are happy to have been part of it!

Prof. Dr. Wolfgang Jäger
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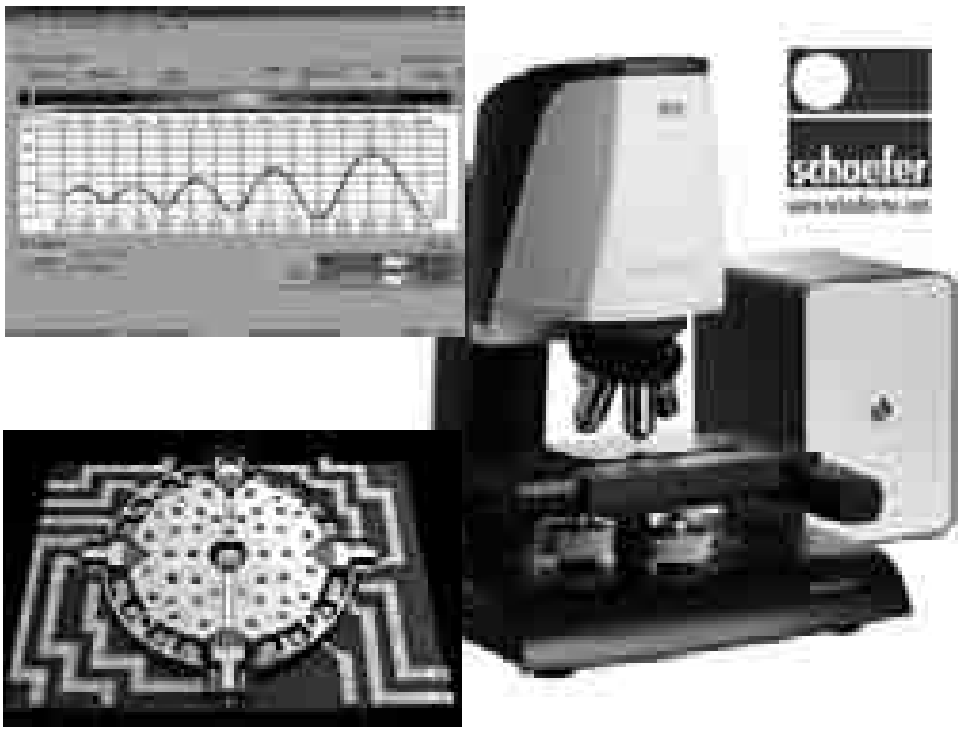

The Schaefer group is presenting the Sensofar PLμ NEOX optical profiler for the measurement of 3D surfaces and thin films. The unique combination of interferometrical or confocal optical profiling and spectral reflectometry on the same sensor head makes the PLμ NEOX the only system in the market able to measure 3D profiles, roughness and thickness of opaque and transparent materials with sub-nanometer resolution.
High NA interferometrical objectives and interferometry technology permits the 3D inspection of extremely polished surfaces to very rough ones.
The optically integrated spectral reflectometer opens an unprecedented combination of an optical profiler and thin-film measurement technology on a single instrument. In real world, white light interferometry is limited to measure thicknesses not less than 500 to 1000 nm. In contrast, the built in spectral reflectometer is able to measure thicknesses down to 10 nm with 0.1 nm of resolution in a tenth of a second and with very high lateral resolution. Measured materials are not limited to be transparent, like in interferometry. With an optically integrated spectral reflectometer it is possible to measure, for example, silicon membrane thickness even if it is an opaque material, and at the same time 3D profile the membrane curvature.

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The physics and chemistry of nano-carbons explored by high-resolution electron microscopy

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Keywords: Carbon, Graphene, High-resolution electron microscopy

Carbon nanotubes [1], [2], [3] fullerenes [4], graphene [5] and graphite are sp^2 bonded carbon allotropes that differ only in their topology. Carbon nanotubes and fullerenes can be described as a rolled-up graphene sheet, whereas graphite can be described as a stack of (weakly interacting) graphene layers [6]. Further structural variations, in particular the incorporation of non-hexagonal rings, lead to the morphologies of activated carbon [7], pentaheptide [8], two-dimensional amorphous carbon [9], and possibly many more. In multi-layered geometries, we can find (besides multi-layered nanotubes), carbon onions [10], [11], cones [12] and scrolls [13]. Fig. 1 is a brief, and inevitably incomplete, illustration of the wide variety of materials that can be generated from sp^2 bonded carbon. In all these materials, the carbon atoms are bonded to three neighbours in a planar or nearly planar geometry. The differences are only the local topology (number of atoms in a ring) and the global topology, i.e. the flat or curved shapes of graphene layers or tubes. The experimental isolation of extended graphene mono-layers [5] allows us to study sp^2 bonded carbon in the most direct way. Free-standing graphene membranes [14] are needed to study graphene by transmission electron microsocopy (TEM). In itself, the graphene membrane structure and its defects are of outstanding interest for science and applications of this promising new material. At the same time, microscopic studies provide more generalized insights to the bonding configurations of sp^2 bonded carbon.

However, low dimensional solids, in particular the carbon allotropes, have always been a special challenge for high-resolution imaging. Due to their low intrinsic contrast and a high susceptibility to radiation damage, the structures and defects in fullerenes, carbon nanotubes and graphene layers often evade a detailed analysis. Nevertheless, most of the carbon allotropes

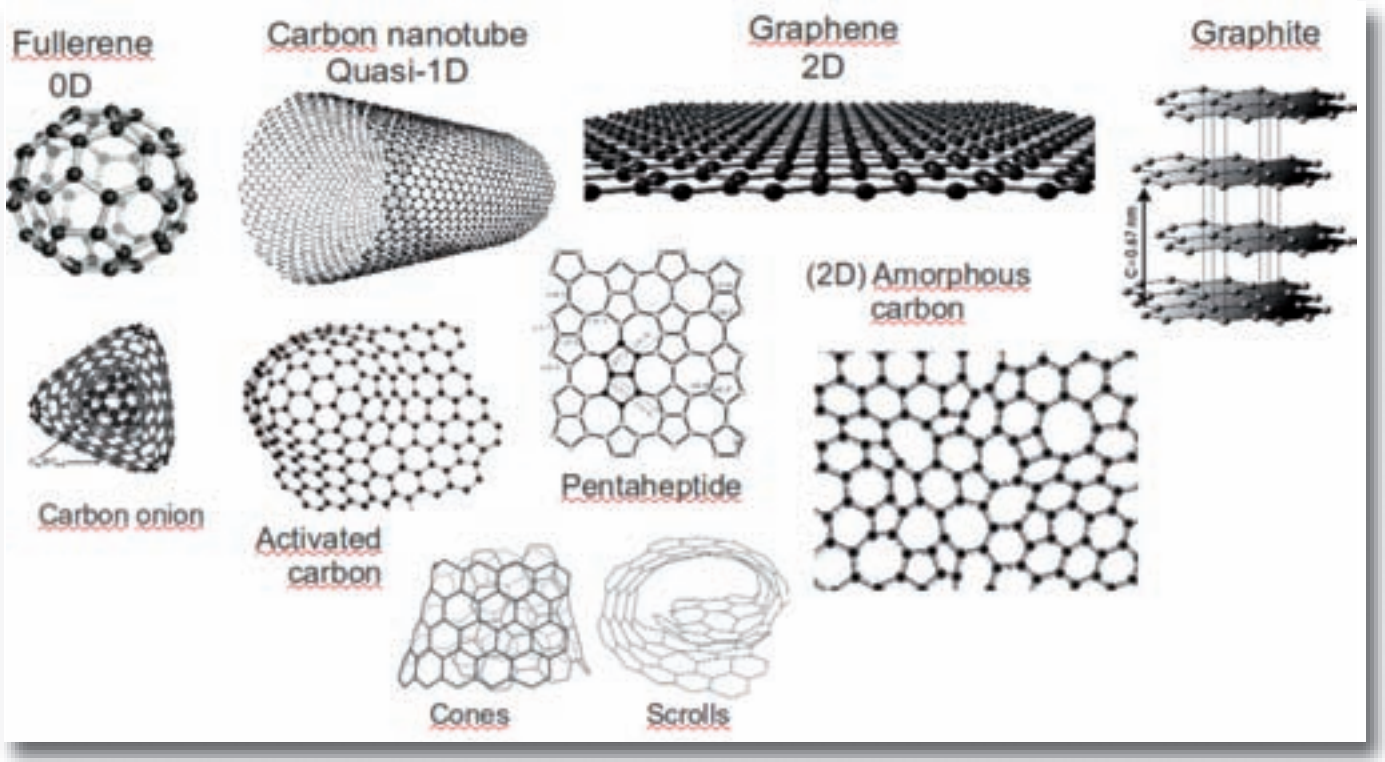

Figure 1: Examples of allotropes and morphologies generated from sp^2 bonded carbon. Images are adapted from Refs. [38], [7], [8], [37] and Wikipedia. 2-D amorphous carbon is described in Ref. [9].

have been discovered or at least identified in electron microscopic studies. The earliest descriptions of tubular carbons date back to 1952 [15] and the widespread interest into carbon nanotubes was initiated by the electron microscopy work of Iijima in 1991 [1]. Single-layer pieces of graphite were described as early as 1962 based on TEM observations [16]. Some of the less regular shapes, such as carbon onions or cones, often appear as by-product during nanotube synthesis and are subsequently found during TEM characterization of the material [17].

The successful correction of electron optical aberrations [18], [19] enabled lattice-resolution transmission electron microscopy at electron energies near or below the knock-on threshold of sp^2 bonded carbon structures [20], [21], [22]. Indeed, the demand to investigate carbon materials was a significant part of the motivation for several recent microscopic developments, in particular towards reduced operating voltages [23], [24], [25]. In addition, the absence of delocalization in the aberration-corrected image enables an unambiguous identification of defect structures [21], [22], dislocations [22], [26], substitutional doping [27], and even amorphous configurations [26], [9] (Fig. 3,4).

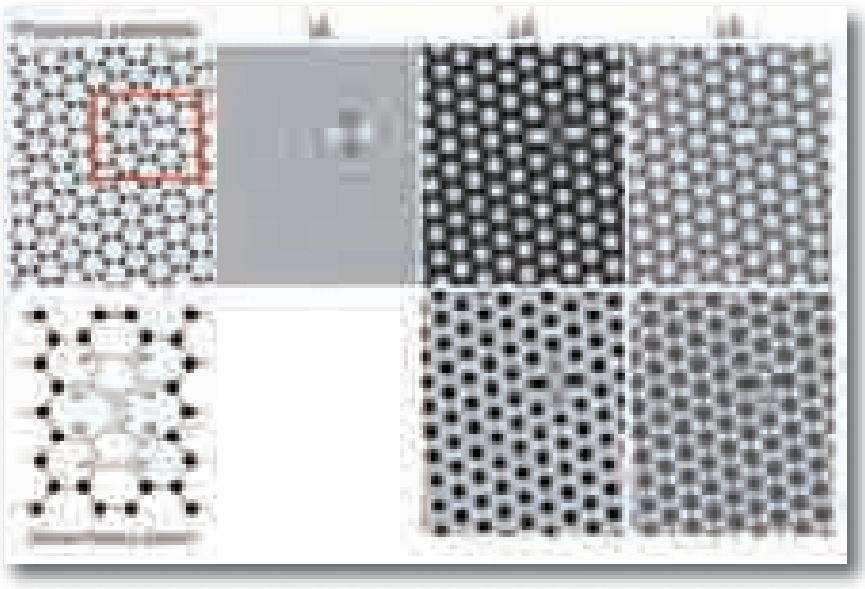

Figure 2: A graphene sheet with a Stone-Wales defect (red box) at different spatial resolution. The upper left image shows the projected potentials (infinite resolution), with dark contrast representing higher projected potentials. The lower left image shows the model of the SW defect, adapted from Ref. [39]. Other images show the projected potentials limited to 3Å, 2Å and 1Å resolution, with dark-atom (top) and bright-atom (bottom) conditions.

Aberration-corrected transmission electron microscopy or scanning transmission electron microscopy can provide information about these materials that are not easily accessible by other means. For example, the above described non-hexagonal rings are difficult to distinguish by spectroscopic methods, since the local bonding geometry is very similar to the hexagonal lattice. Also, the curved surfaces of some of the allotropes are difficult to access with scanning probe instruments. The local topology, ie. the number of carbon atoms in a ring, is a rather important measure in nano-carbon structures: Pure topological defects are (by definition) a deviation from the hexagonal lattice without added or missing atoms, with the Stone-Wales (SW) defect [28] being the most simple example. Vacancies and multi-vacancies typically reconstruct into configurations that involve non-hexagonal rings [29], [9]. Dislocation cores incorporate an unpaired pentagon-heptagon configuration [30], [31], [26], and grain boundaries in graphene display an arrangement of pentagons and heptagons that patch the mismatch between the lattice orientations [32], [33]. Identification of these configurations is therefore pivotal to understanding sp^2 bonded carbons.

Fig. 2 shows how pentagon-heptagon configurations appear at different resolution. With ca. 3Å resolution (uncorrected microscope at 80-100kV), it is possible to detect even very low contrast defects against the featureless background of the pristine lattice, but an identification is difficult. At ~2Å resolution (lattice resolution is 2.13Å for the graphene [10-10] reflection), the graphene hexagon centers are visible as dark or bright spots (depending on the imaging conditions). Here, a pentagon and heptagon can be identified, from having less respectively more contrast at its center as compared to the hexagon. At ~1Å resolution (1.08Å for the graphene [20-20] reflection) all atoms are separated. It is important to note that in principle a point resolution of 2Å is sufficient to identify all the different carbon topologies. Hence, with regard to the current developments towards low-voltage microscopy, it will be interesting to see which will be the lowest voltage where a point resolution of 2Å is achieved.

A real materials example where non-hexagonal configurations appeared as a surprise was the case of

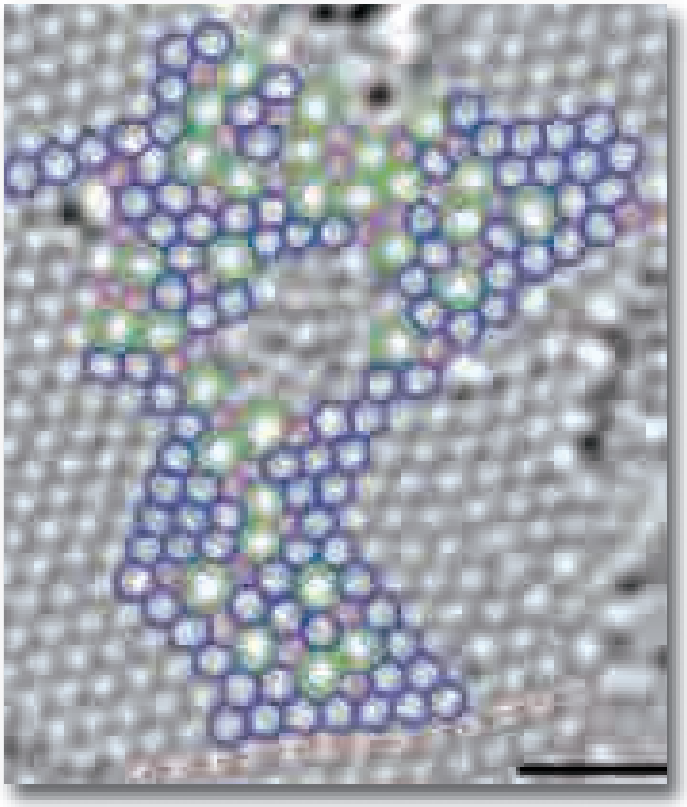

Figure 3: Structural defect in reduced graphene oxide (RGO), adapted from Ref. [26]. Shown are hexagons (blue), pentagons (pink) and heptagons or higher-ordered carbon rings (green). red dashed line indicates a distortion in the lattice. Scale bar 1nm.

reduced graphene oxide (Fig. 3) [26]: Although this material had been extensively studied by spectroscopic means, the large extent of topological defects created by the oxidation-reduction procedure had not been described prior to our electron microscopic study. A different example, a gradual transformation from crystalline, hexagonal graphene to a completely amorphous structure made up from a seemingly random combination of pentagons, hexagons, heptagons and octagons was described in Ref. [9] and is shown in Fig. 4. Here, the transformation is driven by the electron beam: At energies close to the knock-on threshold, the predominant effect of the electron beam are bond rotations rather than atom removal, as also confirmed by molecular dynamics simulations [34].

Graphene is not only important for studies of the material itself, but also, it can serve as a perfect test sample for microscopic developments and as an ideal support film: It has a precisely defined thickness (one layer) and well known structure, one can find areas without any amorphous cover layers even though the samples are prepared in air, it is highly conductive, very stable under lower-voltage irradiation, and the images depend only weakly on sample tilt. Hence, it is possible to observe the exact same atomic configuration under different conditions or in different instruments, independent of how the sample was made. Further, the single layer of carbon atoms is easy to model. Hence the contrast obtained from single-layer graphene may serve as a test criterion for instrumental performance and stability. If adsorbates on the graphene sheet are studied, the underlying lattice can be perfectly removed by a filter.

Our studies of 2-D materials have provided the first experimental cases where the influence of bonding electrons is detected in the high-resolution transmission electron microscope (HRTEM) image contrast [27]. Again, this analysis was enabled by the

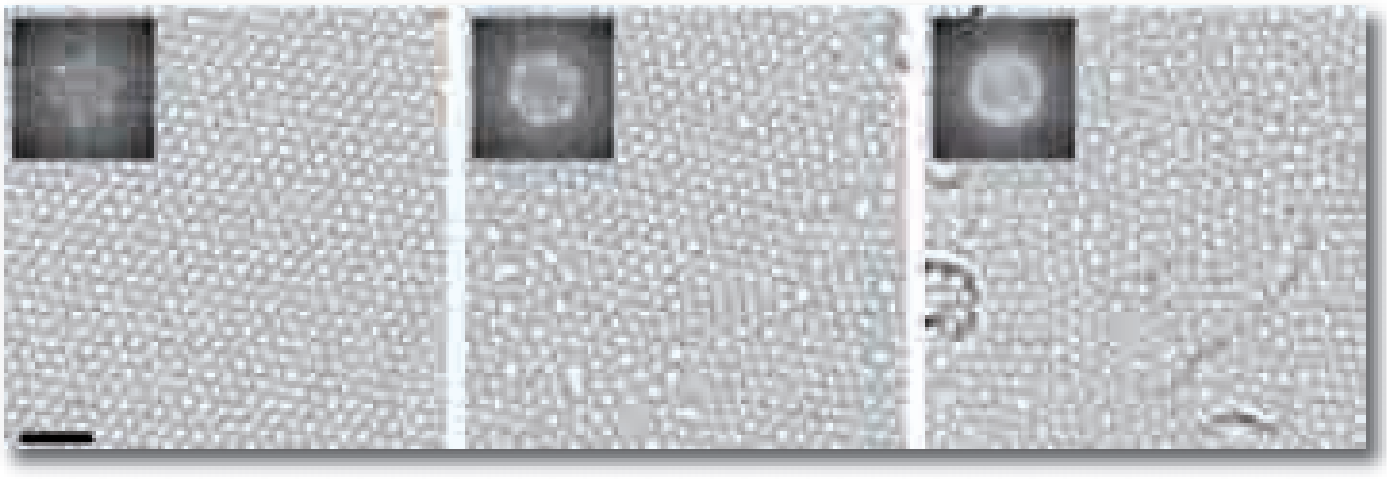

Figure 4: Transformation from graphene to two-dimensional amorphous carbon under 100kV electron irradiation (from Ref. [9]). Scale bar 1nm.

precisely defined sample geometries, high sample stability in the low-voltage electron beam, and the absence of amorphous overlayers. Moreover, it required an adequate treatment of experimental parameters, such as the contrast transfer function, camera modulation transfer [35], or the variation of imaging conditions across the field of view. As is well known from elementary chemistry, the electron distribution is changed when isolated atoms are brought together to form a compound held together by chemical bonds. This change in the charge density, and the resulting change in the sample potential and electron scattering factors [36], is small compared to the total values. Nevertheless, the deviation from the isolated-atom scattering potential can be detected. For the case of nitrogen substitution point defects in graphene, Fig. 5 shows the difference in the projected charge density (Fig. 5a) and the projected potential (Fig 5b) when comparing the independent-atom model and a density-functional theory based calculation. Remarkably, we find a bonding effect that extends onto the nearest neighbor carbon atoms around the nitrogen atom. In other words, a carbon atom next to the nitrogen atom has a different electron scattering factor than a carbon atom elsewhere in the graphene sheet, with a difference large enough to be detectable. The corresponding simulated HRTEM images are in agreement with the the experimental data only for the DFT model [27]. Hence, we can analyse charge redistribution on a single atom level by comparing simulated and experimental data. For non-crystalline configurations, this is currently not possible by any other direct method (For clarity, electron holography should in principle be able to provide equivalent information, but the detection of bonding effects was not yet demonstrated. STEM-EELS can provide information about the electronic energy levels with atomic resolution, but this is a different type of information.). At the same time, this analysis provides important insights to the material: As a first important point, we can visualize individual nitrogen dopants in graphene (Fig. 5c), even though the difference in atomic number is only 1. As a second important point, the comparison of HRTEM data and DFT calculations confirms the modification of the electronic structure on the nearest-neighbor carbon atoms around the nitrogen dopants.

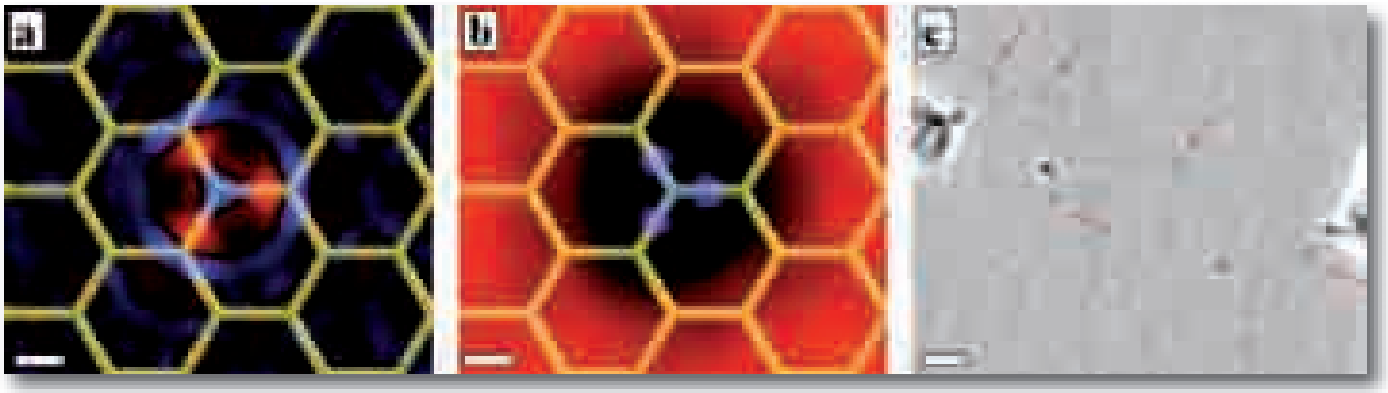

Figure 5: (a) Difference in the projected charge density between the isolated atom model (IAM) and the DFT-based charge density. Red corresponds to a lower, blue to a higher charge density in the bonded configuration (DFT model). (b) Difference DFT-IAM for the projected potentials. The colour scale goes from red via black to blue with increasing projected potential values due to the adjustments in the binding electrons. The periodic components of the graphene lattice were subtracted from the difference images (both a+b, adapted from Ref. [27]). (c) Experimental image of nitrogen substitution atoms in a single-layer graphene membrane (adapted from Ref. [27]). The scale bar is 1Å (a+b) and 1nm (c).

Acknowledgments

I'd like to thank everyone who contributed to the research that is summarized here, in particular U. Kaiser, S. Kurasch, J. Kotakoski, A. Krashenninnikov, C. Gomez-Navarro, A. Chuvilin and V. Skakalova. The research at the University of Ulm was supported by the German Research Foundation (DFG) and the Ministry of Science, Research and the Arts (MWK) of the state Baden-Württemberg within the Sub-Angstrom Low-Voltage Electron Microscopy project (SALVE) and by the DFG within research project SFB 569.

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Structure determination of dynamic macromolecular complexes by single particle cryo-electron microscopy

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Introduction

Macromolecular complexes are at the heart of central regulatory processes of the cell including translation, transcription, splicing, RNA processing, silencing, cell cycle regulation and repair of genes. Detailed understanding of such processes at a molecular level requires structural insights into large macromolecular assemblies consisting of many components such as proteins, RNA and DNA. Single-particle cryo-electron microscopy (cryo-EM) (van Heel et al., 2000) is a powerful method for three-dimensional (3D) structure determination of macromolecular assemblies involved in these essential cellular processes. It is very often the only available technique to determine the 3D structure because of the challenges in purification of complexes in the amounts and quality required for X-ray crystallographic studies. 3D structures can be computed by extensive image processing techniques using large numbers of electron microscopic images of macromolecules embedded in a thin layer of vitrified water (Adrian et al., 1990).

Challenges in 3D structure determination

In recent years it has been shown in a number of publications that it is possible to obtain near-atomic resolution structures of large and rigid macromolecules such as icosahedral viruses (Wolf et al., 2010; Zhang et al., 2010; Zhang et al., 2008). In practice, however, the maximum obtainable resolutions for large and dynamic macromolecules still lacks behind considerably. This can mostly be attributed to the dynamic behavior of many macromolecules that can undergo substantial rearrangements and conformational transitions during their functional cycle (Leschziner and Nogales, 2007; Sander et al., 2006). Very often a macromolecular

Fig.1: Schematic of the single particle cryo-EM technique. First, a macromolecular complex needs to be purified and biochemically optimized. Cryo-EM grids are being prepared by plunge freezing in liquid ethane. Subsequently the ice embedded molecules are imaged in the electron microscope at low temperature under low-dose conditions. Individual particle images are collected and computationally processed to compute the 3D structure. The background shows a typical cryo-EM image of 70S ribosomes.

complex in solution thus represents a mixture of populations that can vary substantially in structure and conformation.

Whenever single particle cryo-EM is applied to dynamic macromolecular complexes, the possibility of having substantial structural and conformational variations within one sample of purified macromolecules is not negligible. It is in fact one of the most important resolution limiting factors of the technique. In some - and not even rare- cases, the dynamic nature of macromolecules may prevent successful structure determination entirely (Kastner et al., 2008; Sander et al., 2006). Consequently, there are multi-facetted requirements for single particle cryo-EM to become a generically applicable tool for near-atomic resolution structure determination of macromolecules. Modern state-of-the art, high-resolution electron microscopes with stable cryo stages and a large extent of automation capabilities are already available. Furthermore, there is a number of technical developments like corrector lens optics (Haider et al., 2009), direct detectors, improved electron sources and phase plates (Majorovits et al., 2007) that are currently being tested. However, it is important to note that even the available electron microscopes are very often not the main resolution limiting factor in single particle cryo-EM.

In the first place macromolecules themselves need to be treated with care during the biochemical purification and sample preparation procedures. This is by no means trivial because many macromolecules do not tolerate standard biochemical purification procedures without being severely damaged. Thus, there is substantial need for improved biochemical tools and systematic screening of complex stability prior to sample preparation for EM (Kastner et al., 2008).

Once a stabilized macromolecular complex is under biochemical control it is relatively straightforward to record several hundred thousand molecular high-resolution cryo images within a few days of electron microscopy. Nevertheless, even biochemically stable complexes may display pronounced conformational flexibility that prevents direct high-resolution structure determination (Sander et al., 2010). Computational methods are thus needed to "purify" macromolecules by image processing after the maximum biochemical purification level has been reached. The computational separation of a heterogeneous data set of macromolecular images representing the same object in various different conformations is highly challenging especially in the absence of an initial 3D model of the macromolecule. A number of computational methods were developed in recent years that provide different solutions and allow an increasing level of "in silico" purification of dynamic macromolecular complexes (Sander et al., 2010; Scheres, 2010; Scheres et al., 2009).

Assuming that the computational sorting of images works accurately enough to purify macromolecular images to homogeneity, it will require substantial computational and infrastructural resources to deal with the vast amount of data and computational image processing that needs to be handled. While computers are getting cheaper and at the same time more powerful, the computational analysis of several million images within a project that may be required for near-atomic structure determination, needs still several months of processing time on a midsized computer cluster. The computational sorting required to refine a large number of 3D structures in parallel also represents additional challenges in data organization and parallelization. New software design principles are likely to emerge that can keep up with the requirements of massive data processing and organization (Schmeisser et al., 2009).

The Ribosome in Motion

Ribosomes are the protein factories of the cell. For protein synthesis, amino acid charged tRNAs need to

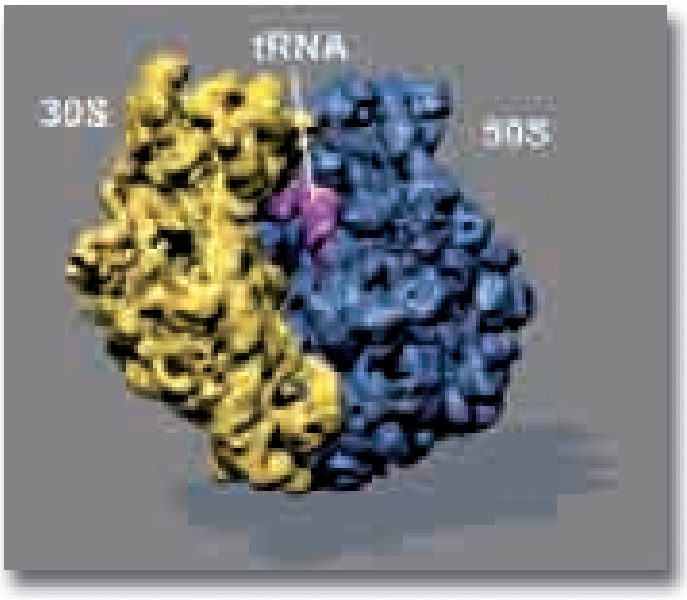

Fig. 2: 3D reconstruction of the ribosome after computational image sorting. The large subunit (blue), small subunit (yellow) and the tRNA in the P site (magenta) are depicted.

be delivered to the ribosome. During the elongation of the synthesized protein chain tRNAs move through the intersubunit space of the ribosome.

We wanted to understand this movement on a structural level and have used retro-translocating 70S ribosomes to study the movement of tRNAs through the ribosome by time-resolved electron cryomicroscopy (Fischer et al., 2010). A large image data set of ~2.000.000 raw images was collected at different time-points during retro-translocation. We have subjected this heterogeneous data set to a series of classification steps in order to separate the raw images into sub-populations that do belong to the same 3D structure of the ribosome. After the computational separation of images we were able to obtain 50 different ribosome 3D structures. The structures were obtained at up to 9Å resolution and result in very clear and well defined 3D maps where some alpha helices can already be observed (Fig. 2).

The computational sorting also allows visualization of the entire tRNA trajectory through the ribosome in a "movie-like" manner and even includes entirely novel binding states of tRNAs (Fig. 3). Since we do not only see tRNA binding in various positions but also the conformational variations of the ribosome structure that are associated to certain tRNA binding states, we can determine how certain conformational modes of the ribosome (like subunit ratcheting and 30S head movements) are coupled to tRNA movement through the ribosome. In spite of the fact that single particle cryo-EM is a static method, it can thus be used to visualize dynamic events in macromolecular complexes if we collect data at various time points during the reaction pathway. Following the population statistics of ribosomes with tRNAs bound to the various binding sites on the ribosome we can even determine kinetic rate constants and the energy landscape of the conformational transitions of a large macromolecular complex (Fig. 4).

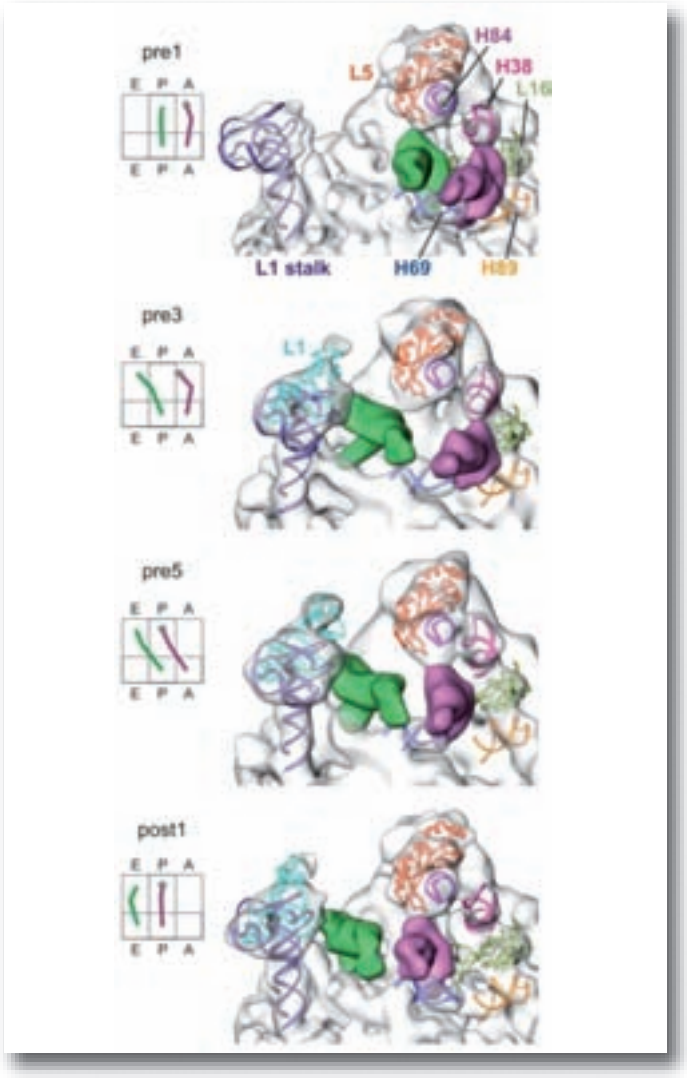

Fig. 3: Four out of fifty ribosome 3D structures showing tRNAs bound to different positions during the process of translocation. The small 30S subunit was computationally removed for visual clarity. From Fischer et al., (2010).

Conclusions

There are great perspectives for structural analysis of large and dynamic macromolecules by single particle cryo-EM. In contrast to X-ray, single particle cryo-EM can provide a whole set of 3D structures from one

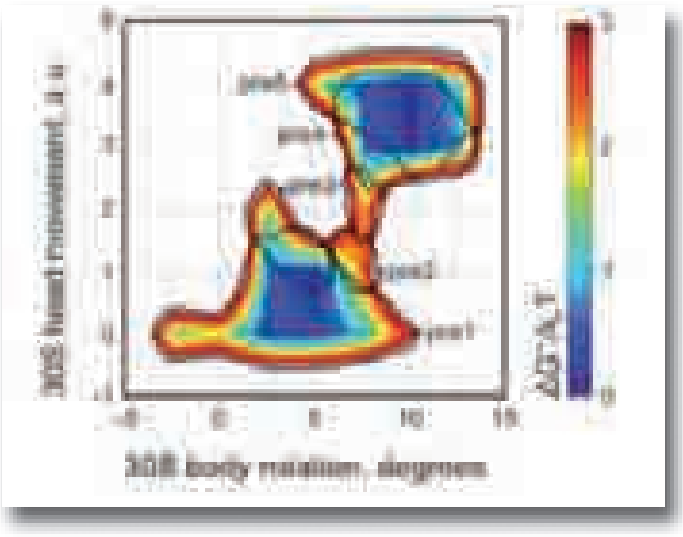

Fig. 4: Energy landscape of the pre-translocational ribosome in defferent states (pre1 – pre5). From Fisher et al., (2010).

large data set which represents the macromolecule in various different conformations. One can thus learn about the structure of a macromolecular complex at near-atomic resolution and about its dynamic behavior simultaneously which is essential for understanding the function of macromolecules at a molecular level.

Acknowledgments

I would like to thank all the people who have contributed to this research and the developments of methods. Especially, Niels Fischer who did the work on the ribosome. Research was supported by grants from the Federal Ministry of Education and Research (BMBF), Germany, the Sixth Framework Programme of the European Union via the Integrated Project 3DRepertoire and the Lower-Saxony Israel grant. Niels Fischer was supported by a Boehringer-Ingelheim fellowship.

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10th MULTINATIONAL CONGRESS ON MICROSCOPY MCM2011• URBINO

10th Multinational Congress on Microscopy 2011

Urbino, 4-9 September

The Xth Multinational Congress on Microscopy was organized by the Italian Society of Microscopy, the Austrian Society for Electron Microscopy, the Croatian Microscopy Society, Czechoslovak Microscopy Society, the Hungarian Society of Microscopical Sciences, the Serbian Society for Microscopy and the Slovene Society for Microscopy on 4-9 September 2011.

It was preceded by a Satellite Workshop on "Tomography, 3D Reconstruction and 3D Imaging Techniques", organized in Ancona by Prof. P. Mengucci on 3 September afternoon and 4 morning.

The Scientific Campus of Urbino University was MCM 2011 venue, where 405 registered people participated with plenary lectures, invited presentations, as well as oral and poster contributions.

Dr. G. Arancia, Laboratory Director at Rome NIH, as well as Past President and Honorary Member of the Italian Society of Microscopical Sciences (SISM), gave the introductory lecture, on Saturday 4, entitled "Short history of the Multinational Congress on Microscopy". Successively Dr L. Bedini of Urbino University, presented the city to delegates with "Urbino: an ideal city".

The following Welcome Party, on the campus terrace, was kindly offered by FEI.

On Monday 5, the Welcome Ceremony took place, and Prof. P. Midgley, EMS President, Dr. A. Montone, SISM President, City Authorities, and Prof. E. Falcieri, MCM 2011 President, opened scientific sessions.

Eight plenary sessions, two a day, were presented in the Main Hall from Monday to Thursday. Prof. J. L.Carrascosa (Madrid, ES), Prof A. Kovacs (Copenhagen, DEN), Prof. C. Colliex (Paris, FR), Prof. B. Brunetti (Perugia, IT), Prof. G. Van Tendeloo (Antwerp, BE), Prof. S. Cinti (Ancona, IT), Prof. A. Nanci (Montreal, CND) and Prof. V. Radmilovic (Berkeley, USA/ Belgrade, SRB), all outstanding scientists in Instrumentation and Methodology (IM), Life Sciences (LS) and Materials Sciences (MS), captured the attention of more than 300 participants.

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Parallel sessions, chaired by well known microscopists suggested by Multinational Societies, followed in the Main Hall and in two further rooms of the campus, and covered important subjects on IM, LS and MS, with presenting authors from all over Europe. The assistance to the conference rooms, as well as that to Registration and Information Desks, was guaranteed by a group of English students from Urbino University.

At the slide center, continuously working close the Main Hall, free wi-fi connection was provided to all delegates at request.

The 352 abstracts, rigorously evaluated by the Scientific Programme Committee, have been published in the CD-provided Proceedings Book.

Protagonists of the Trade Exhibition, organized in equipped spaces at Campus ground floor, were: Agilent, Assing, Cameca, Crytur, Delong, Diatome, Emme 3, FEI, Fischione, Gatan, Hitachi, Jeol, Leica, Nikon, Olympus, Oxford Instruments, Perkin Elmer, Quorum, SPI Supplies, Technoorg and Tescan.

MCM 2011 had the extension of the European Microscopy Society and, consequently, a financial support for two plenary speakers, as well as 14 scholarships for students.

Moreover, SISM assigned six fellowships (500 euros) for student congress participation and two "Carla Milanesi" prizes.

30 poster prizes (100 euros) were further assigned after a careful evaluation by Multinational Presidents, at the conference dinner, organized on Thursday 8 in the Sala Raffaello, an historical site in Urbino Center.

Many delegates utilized University Residences, provided at very low cost, which allowed, together with low registration fees, to have a great number of young people, so achieving one of the important goals of MCM2011. Other participants reserved their room at the hotels in city center, and a very frequent shuttle service guaranteed a continuous connection between the Scientific Campus and the different accommodation sites.

In the social programme, guided visits to Palazzo Ducale and those to Urbino ancient center and Horatories were scheduled. A bus tour to Gola del Furlo was also organized for accompanying people. Conference Dinner, with EMS and poster prize awards, were organized in the Renaissance Sala Raffaello in Urbino centre. A typical dinner with local cooking and musical entertainment in another historical site encountered a diffuse enthusiasm. Thanks to the high quality of scientific presentations and to the wonderful atmosphere of Urbino, the MCM2011 has surely been a successful conference, which continued the excellent twenty-year-old tradition of the Multinational Congresses of Microscopy.

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Electron microscopy of transition-metal-doped semiconductors

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Introduction

Over the past ten years, magnetic semiconductors have raised high expectations as potential spin-electronic materials that exhibit room temperature magnetism, while retaining their desirable semiconducting properties [1]. Semiconductors such as GaAs, ZnO and GaN are usually doped with transition metals such as Mn, Co and Fe in order to make them magnetic. Inadequate structural characterization of these materials has led to several controversial publications, in which the origin of the magnetic properties has been misinterpreted. Here, we describe how transmission electron microscopy (TEM) can be applied to the study of magnetic semiconductors to provide structural, chemical and magnetic information about the transition metal dopant and defect distributions with high spatial resolution.

For TEM studies, one of the most important challenges is the preparation of a high quality cross-sectional specimen of the transition-metal-doped semiconductor that is representative of its real structure. The specimens that are described below were prepared using conventional mechanical polishing and Ar ion milling and finished using low ion energies (< 1 keV) in order to minimize ion beam induced artifacts. Milling with high energy ions results in the formation of an amorphous (e.g., nitrides, arsenides or oxide) layer on the specimen surface or can make the surface very rough. The resulting artifacts can easily be misinterpreted as aggregation of the dopant material. Figure 1 shows high-resolution images of cross-sectional specimens of an Fe-doped GaN layer finished at high and low ion energies.

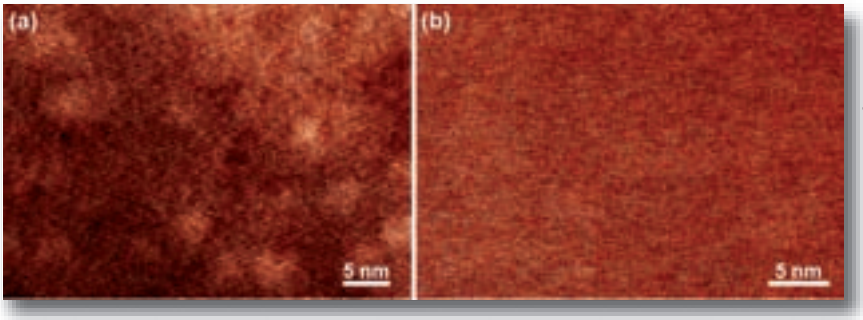

Figure 1: High-resolution annular dark-field (ADF) scanning TEM (STEM) images of the same Fe-doped GaN layer finished at (a) 2.4 keV and at (b) 0.5 keV Ar ion energies. The beam damage on the specimen surface in (a) can easily be misinterpreted as Fe agglomeration in the layer.

Results

Mn-doped GaAs layers were grown using molecular beam epitaxy at 270°C. The Mn concentration was varied between 0.1 and 2 %. The layers were annealed at temperatures above 500°C in order to induce MnAs nanocrystal formation in GaAs [2]. We used aberration-corrected TEM and scanning TEM (STEM) combined with electron energy-loss spectroscopy (EELS) and energy dispersive X-ray spectroscopy (EDXS) to study the embedded nanocrystals. Only the nanocrystals that were inside the specimen were analysed, in order to avoid the effects of surface oxidation and structural relaxation. TEM studies of annealed GaMnAs layers revealed the formation of nanocrystal-void complexes in annealed samples [3]. Figure 2 shows representative results illustrating the structures and elemental distributions of two such complexes. Annular dark-field (ADF) STEM and EDXS signals were recorded simultaneously in order to characterize the elemental distributions of Ga, As and Mn in the marked region in Fig. 2 (a). A Mn signal was only detected in a crystal that was identified as MnAs, while the As signal was strongest from a region that was identified as rhombohedral As (r-As, space group 166, symbol R-3m, a = 0.376 nm, c = 1.055 nm). The lattice parameters of the MnAs nanocrystal were measured by nano-beam electron diffraction, as shown in Fig. 2(b) [3], using a parallel electron beam of ~2 nm diameter in "microprobe" mode with 50 µm C2 and 30 µm C3 condenser apertures on an FEI Titan microscope and with GaAs reflections used as a standard. Figure 2 (c) shows an aberration-corrected high-resolution TEM image of another nanocrystalline complex, in which an image simulation (shown inset) was used to identify orthorhombic As (o-As, space group 64, symbol Bmab, a = 0.365 nm, b = 0.447 nm, c = 1.1 nm) formation.

The aberration-corrected STEM probe that is as small as ~1 Å in diameter can be

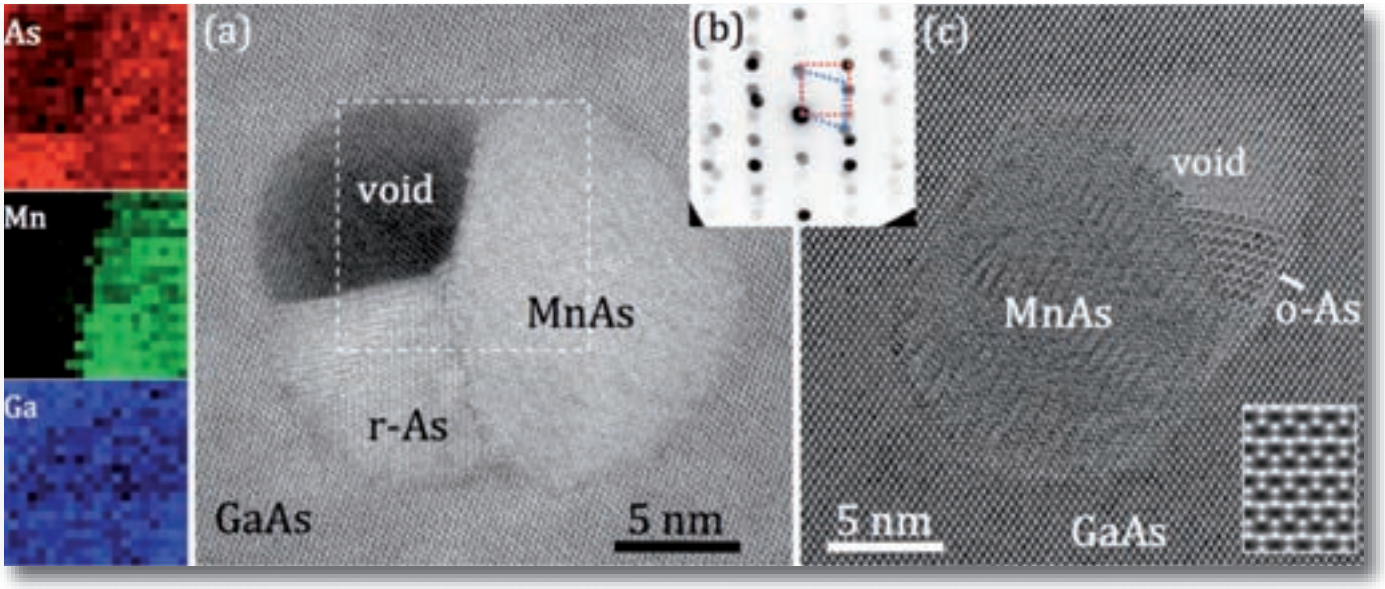

Figure 2: (a) Aberration-corrected high-resolution ADF STEM image of a nanocrystalline complex containing a void, a hexagonal MnAs crystal and a twinned rhombohedral-As (r-As) crystal in GaAs. The ADF inner detector semi-angle used was 47.4 mrad. The three frames on the left show As, Mn and Ga distributions from the region marked in (a) using point-by-point EDXS analysis with 400 points and an acquisition time of each 20 s. (b) Nano-beam electron diffraction pattern acquired from a hexagonal MnAs crystal and the surrounding GaAs host. (c) Aberration-corrected high-resolution TEM image of a complex containing an orthorhombic As crystal. The inset shows a simulated TEM image of o-As viewed along the [100] direction.

used for high-resolution and local analytical measurements. However, the high current density can damage the specimen. We took advantage of this capability to modify the specimen using the incident electron beam to perform an unusual experiment on an Fe-N nanocrystal located adjacent to a molecular N2 filled bubble embedded in GaN, as shown in Fig. 3. The Fe-doped GaN layer studied in this experiment was grown by metal-organic chemical vapour deposition at 850°C. The structures of the Fe-N nanocrystals that formed in the GaN matrix were identified using electron diffraction and EELS. The presence of nitrogen bubbles in the samples was also confirmed using EELS. First, the EEL spectra were acquired from a bubble, an Fe-N nanocrystal and GaN, as shown in Fig. 3 (b). The N K edge shows a three-peaked structure between 400 and 407 eV. At the position of the bubble, the first peak in the fine structure is stronger than the other peaks due to the presence of molecular N2. A 100 kV acceleration voltage and a distributed-dose EELS acquisition routine [4] were used to either minimize or control electron beam induced damage during the experiment. Then, a static sub-Ångstrom beam with a current of ~350 pA was used to make a hole in the specimen at the position of the bubble, while recording EEL spectra every 40 s. The intensity of the characteristic first peak of the N K edge at 401 eV was observed to decrease suddenly when the gas was released from the specimen. This experiment confirmed the presence of nitrogen gas in the bubble unambiguously.

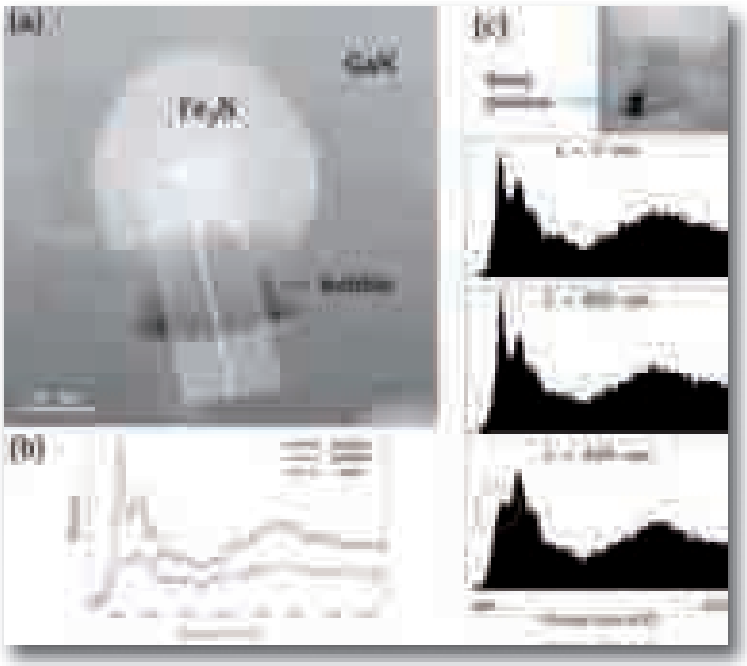

Figure 3: (a) ADF STEM image of an Fe-N nanocrystal and an adjacent N2 bubble in GaN. Line-scan EELS measurements were acquired in the direction of the arrow from the area indicated by the box. (b) Background-subtracted N K edge EEL spectra measured from the Fe-N nanocrystal, N2 bubble and GaN host. (c) ADF STEM image and time series N K edge measurements recorded while drilling a hole through the GaN using a stationary focused electron probe. The intensity of the first peak in the spectrum is reduced significantly when molecular nitrogen is released from the specimen.

Summary

High-spatial resolution structural and chemical studies of transition-metal-doped semi-conductors in the TEM are only possible if great care is devoted to specimen preparation. Representative examples of the recent characterization of nanocrystal-void complexes in Mn-doped GaAs and Fe-doped GaN have been described. Future studies may allow the compositional distributions and magnetic properties of both clustered and fully diluted regions of such samples to be studied with sub-nm spatial resolution.

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I would like to thank many people who contributed to this research including Rafal Dunin-Borkowski, Takeshi Kasama, Janusz Sadowski and Bernhard Schaffer. Prof. T. Dietl and Prof. A. Bonanni are gratefully acknowledged for discussions and for providing the samples. The experiments were performed at the Center for Electron Nanoscopy in the Technical University of Denmark and at SuperSTEM, STFC Daresbury Laboratories, UK. This work was supported by the "FunDMS" Advanced Grant of the European Research Council within the "Ideas" 7th Framework Programme of the European Commission.

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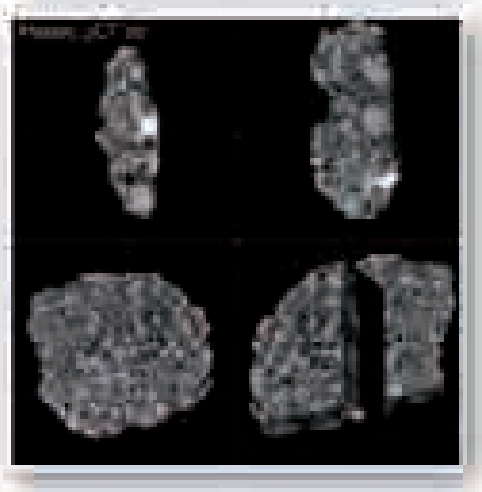

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REPORTS ON EMS SPONSORED EVENTS

WINTERSCHOOL 2011: PRACTICAL COURSE IN ADVANCED MICROSCOPY • ETH ZURICH

Winterschool 2011: Practical course in advanced microscopy • ETH ZURICH • January 16-21 2011

Organization :

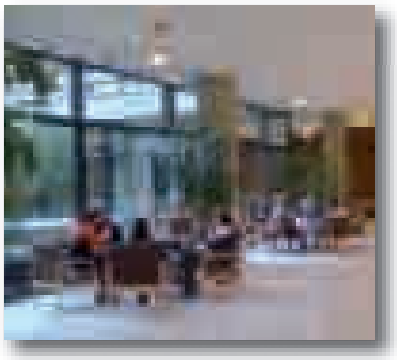
Urs Ziegler, Andres Kaech,
Center for Microscopy and Image Analysis,
University of Zürich
Roger Wepf, Susanne H. Keller,
EMEZ, Electron Microscopy ETH Zürich
Gabor Cùcs,
Light Microscopy Centre ETH Zürich

Science City ETH Zürich

Zürich University Irchel

This annual advanced microscopy course intended for PhD students and post-graduates with prior experience in microscopy took place at the University of Zurich form January 16 to January 21, 2011. The course base alternates between **Science City ETH Zurich (EMEZ Electron Microscopy ETH Zurich) and University of Zurich (Center for Microscopy and Image Analysis)**, since it is a coproduction of the two microscopy centers.

The students used instruments from both centers, depending on their choice of workshops and techniques. The strategic alliance for this course between the two centers offers a wider variety of instruments, techniques and know-how. The goal of the course was to teach and train fundamental knowledge and skills in a specific microscopic technique. After the course, students should be able to apply this technique to their own present and future projects. Practical work consisted of seven different modules co-vering a specific topic each (please see list below). Each module lasted throughout the whole course. Students participated in one practical module only. For the practical training the students used the latest instrumentation. Apart from practical modules, theoretical sessions provided sound background of all the different techniques for all students.



The Industry Day, Wednesday, January 19th, provided an overview of the latest research in instrumentation and techniques currently available. 12 companies in the field of light and electron microscopy gave talks. The key note speaker, Professor Ohad Medalia, an acknowledged expert in the field of cryo-electron tomography gave a special lecture on the subject of "Exploring the inner space". His research focuses on marcomolecular structures and mechanisms in eukaryotic cells, such as the integrin-mediated cell adhesion, the nuclear pore complex and the organization of nuclear lamin filaments.

Credit Points

The course is awarded 2 ECTS credit points

Modules

Module 1: High resolution light microscopy

Module 2: Life Cell Microscopy

Module 3: Fine structure preparation for transmission electron microscopy

Module 4: Immuno electron microscopy

Module 5: 3D Correlative Microscopy (CLSM/FIB-SEM)

Module 6: Array Tomography - 2D Correlative Microscopy

Module 7: CryoTEM Tomography and Stereo TEM (SEM)

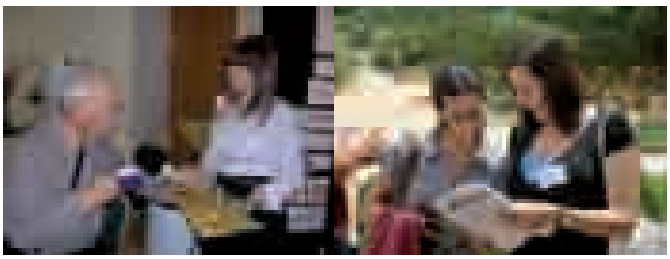
ISM 2011: meeting • ISRAËL • May 25-26 2011

The Israel Society for Microscopy (ISM) is a non-profit organization and the home of a small (~ 100 members) but highly motivated community. We hold annual international meetings towards the end of May; traditionally 1-day gathering at one of the universities.

This year we celebrated with a 2-day meeting. ISM 2011 was held on 25-26 May in the beautiful site of Kibbutz HaGoshrim. The first day started with tutorials on light microscopy and cryo-EM. Over 50 members attended this activity, among them many students. The formal meeting began at 14:30 and ended close to midnight. We had plenary lectures on X-ray microscopy and scanning probe techniques, a SoundBite session, a poster session and vendor exhibition, and an after-dinner lecture on *The Hula Valley Birds.*

We started the second day with the plenary talk of Prof. Christian Colliex, the former president of the International Federation of Societies for Microscopy, who gave an inspiring lecture titled ***From STEM-EELS to multi-dimensional and multi-signal electron microscopy***. This was followed by parallel sessions (in life and materials sciences), a session for Exhibitor presentations dedicated to recent advances in microscopy techniques and equipment, and a second poster session and micrograph competition. Parallel sessions continued till 16:00, and ended the program.

We especially emphasized this year student activities. Several student were selected to give oral presentations based on their submitted abstracts. In addition, the tutorials, SoundBite session, and two poster sessions allowed students and post-docs to be active participants. Five student prizes were awarded this year: The SIG-4 Prize, a contribution by NanoMegas and the Special Interest Group on Electron Crystallography of the European Crystallography Association, was awarded to a student on exceptional research in the field of HRTEM or Electron Crystallography; The Lev Margulis Memorial Prize, supported by Dr. Margulis' family was awarded for an outstanding work in life sciences. We also awarded two "best poster" prizes (one in each field), and a fifth prize went to the most popular micrograph. According to our new tradition, the winning micrograph will be displayed in the ISM home page for the year, and will decorate the ISM2012 poster.



The ISM assembly meeting was held on the second day. We approved the 2010 budget and the association 2006-2010 formal documents. Further, we elected five new members to the ISM board, replacing 3 members who completed their appointment.

All together we had 2 wonderful days with >120 participants, ~ 25 lectures on cutting edge research and advances in microscopy methods, good food and drinks, and a great, friendly atmosphere.

We highly appreciate the contribution of the European Microscopy Society to our meeting. Your support was acknowledged by placing the EMS logo next to the ISM logo in the ISM2011 webpage as well as in the program, and by announcing it (and displaying on the screen) in the plenary session gathering. We are proud to be an active member of the EMS, and our Board will continue its activities in promoting the goals of the EMS and ISM in the future.

Dganit Danino,
ISM Chair

CELL CYCLE, CANCER & DEVELOPMENT • SAINT MALO

Cell Cycle, Cancer & Development
SAINT MALO, FRANCE • May 25-28 2011

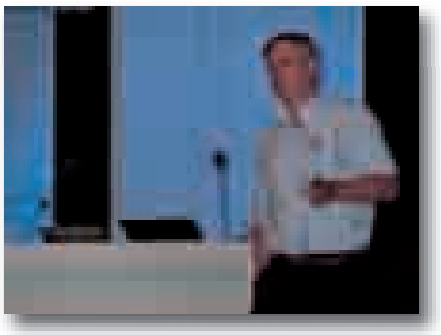
The meeting was organized by

Dr Claude Prigent (Rennes)
and **Bernard Ducommun** (Toulouse)

About 200 people attended the Cell Cycle Cancer & Development meeting at Saint Malo. We had the chance to get financial support from 17 sponsors (thanks to EMS) and 13 exhibitors were present on site. We had the pleasure to hear conferences given by 18 invited speakers and 22 selected speakers

The 34th international symposium of the French Society for Cell Biology (SBCF) was held at the Palais du Grand Large in Saint Malo in Mai 2011.The «Cell Cycle, Cancer & Development» meeting was the second meeting of a series initiated in Toulouse in 2008 «Cell Cycle & Cancer».

The following topics were represented:
Mitosis, drug design and cancer therapy, DNA recombination, repair, replication , epigenetics, stem



The 2001 Nobel prize Sir Tim Hunt gave the first keynote lecture.

cell, polarity and asymetric division -cell movement and morphogenesis, Dr Erich Nigg, director of the Biozentrum in Basel gave the EMS Keynote lecture. He presented his work on centrosome duplication and

chromosome segregation. The meeting was a real success: the science, the site «Saint Malo» and the social events. The main social events of the meeting was a private visit of the Mont Saint Michel with a diner cocktail organized in the abbey. The visit was exceptional and very appreciated by the delegates.

43rd COURSE -ELECTRON CRYSTALLOGRAPHY: NEW METHODS TO EXPLORE STRUCTURE AND PROPERTIES OF THE NANO WORLD • ERICE

«Ettore Majorana» Foundation and International Centre for Scientific Culture INTERNATIONAL SCHOOL OF CRYSTALLOGRAPHY 43rd Course - Electron Crystallography: New Methods to Explore Structure and Properties of the Nano World • ERICE, Italy • 2 -12 June 2011

The course was held in parallel to the course "The Power of Powder Diffraction" and counted in total 90 participants from 25 countries. The program included 38 lectures given by 31 speakers, 9 demo talks and 16 lab courses given by 4 additional speakers. 25 posters were presented.

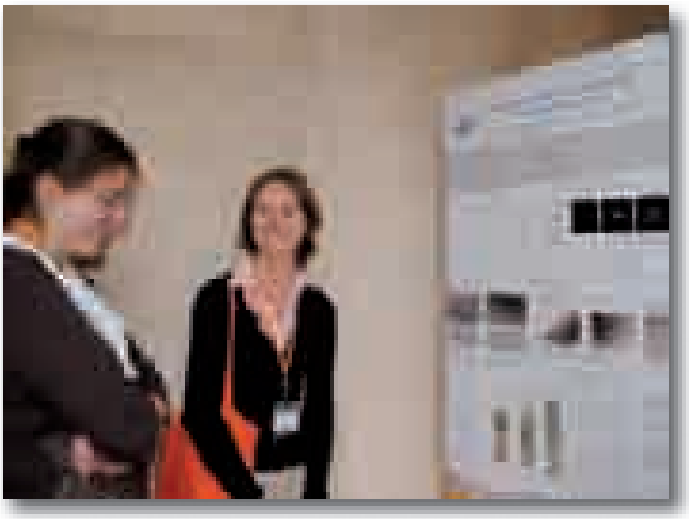
It intended to review structure solution using established electron crystallography methods as well as novel applications; and followed three major aims:

1) provide a strong background on crystallography in general and electron crystallography in particular

Since the participants of this school were strongly diverse in education the concept of basic lectures for both, crystallography and electron microscopy turned out to be extremely helpful. This was supported by the significant work and effort of highly reputed scientists in the field. (Mauro Gemmi, Italy; Carmelo Giacovazzo, Italy; Kenji Tsuda, Japan; Louisa Meshi, Israel; Laurence Marks, USA; Jouk Jansen, The Netherlands; Dirk Van Dyck, Belgium; Jean-Paul Morniroli, France; Joke Hadermann, Belgium; Robert Dinnebier, Germany). There were lectures on the fundamentals of crystallography, electron diffraction theory and the theory of image formation in the electron microscope as well as the construction of electron microscopes.
Here the additional lecturers who provided a wide range of topics via demo talks and lab sessions need to be mentioned (Tatiana Gorelik, Germany; Enrico Mugnaioli, Germany; Peter Müller, USA; Gian Luca Cascarano, Italy). These sessions were highly attended and provided a deep insight into important software for data analysis, processing and interpretation.

2) introduce students to upcoming techniques for data acquisition and data processing as well as to the state-of-the-art electron microscopy

The overall structure of the school was diverse and comprehensive. It covered almost all aspects of modern electron crystallography and allowed participants of the school to learn about both the traditional areas that are still being used and improved, and modern methods of developing intensive structural studies. New technical developments (Ondrej Krivanek, USA; Ute Kaiser, Germany; Jan Pieter Abrahams, The Netherlands) as well as new methodologies (Peter Oleynikov, Sweden; Stefano Rubino, Sweden; Christoph Koch, Germany; Ute Kolb, Germany) were covered. In addition a series of talks about already established methods and the possibilities to improve their precision were given (Sven Hovmöller, Sweden; Stavros Nicolopoulos, Belgium; Kenji Tsuda, Japan; Yimei Zhu, USA; Anatoly Avilov, Russia; Mauro Gemmi, Italy; Laurence Marks, USA; Jouk Jansen, The Netherlands)

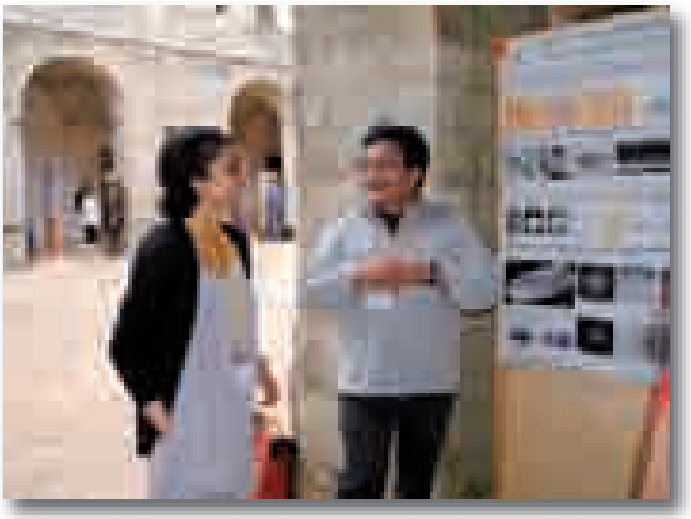


3) cover different approaches for structure solution and derive structure-property relationship

The structure solution lectures covered the major approaches of the field and were held joined with the powder course (Carmelo Giaccovazzo, Italy; Chris Gilmore, Scotland; Lukas Palatinus, Czech Rep.; Kenneth Shankland, Britain; Christian Bärlocher, Switzerland; Martin Ullrich Schmidt, Germany).

43rd COURSE -ELECTRON CRYSTALLOGRAPHY: NEW METHODS TO EXPLORE STRUCTURE AND PROPERTIES OF THE NANO WORLD • ERICE

Especially these joined lectures gave the participants of both courses a chance to have a glance onto and a deeper understanding of an adjacent and complementary scientific field. In addition specialized methods and algorithms to achieve structural information were presented (F. Chukovskii, Russia; Andrew Stewart, Germany). The course covered a wide diversity of topics from electron crystallography of inorganic materials through aperiodic structures to the electron crystallography of proteins and organic materials (Marin van Heel, Britain; Jan Pieter Abrahams, The Netherlands; Martin Ullrich Schmidt, Germany). The investigation of structure-property relationship was covered by methods of direct measurements as well as an indirect analysis through a structure solution. (Stefano Rubino, Sweden; Rafal Dunin-Borkowski, Germany; Martin Hytch, USA)



The lecturers of the course were mainly leading scientists in the field but also young and promising scientists. This and the high diversity of topics gave all scientists, lecturers and students, the opportunity to learn from each other and to gain new ideas.

Several awards of books were made for the best poster presentations. The main ('Lodovico') award was made to Bo Song (University of Delft) for astute questioning of speakers and contributions to discussions over the duration of the course. The contributions of several other participants to lively and informed debates in the lecture sessions were recognized by book awards. The lecture, demonstration and workshop sessions were always very well attended and positively received.

The nature of the Ettore Majorana Centre, coupled with the tireless efforts of the local organizing committee, contributed massively to the success of the meeting. Feedback from the participants was overwhelmingly positive, with an average rating of 90/100 returned for the meeting overall. Importantly, more than 98% of attendees expressed the feeling that there should be another meeting along similar lines, held within the next 6 years. Various suggestions for improvements at future meetings were also received, particularly in respect of maximising the value of the workshop components.

XIV INTERNATIONAL CONFERENCE ON ELECTRON MICROSCOPY (EM2011) • WISLA

XIV International Conference on Electron Microscopy (EM2011) • WISLA • June 26-30 2011

The XIV International Conference on Electron Microscopy (EM2011) was held in June 26-30 2011 in Wisła, Poland. Wisła is located in southern Poland in the heart of the Silesian Beskids Mountains on the Wistula River spring near the border with the Czech Republic. The conference was organized by the Institute of Materials Science, University of Silesia in Katowice, Poland, under the auspices of the Polish Microscopy Society (PTMi), Polish Materials Society (PTM) and European Microscopy Society (EMS).

The scope of the EM2011 was to provide a broad overview of the recent achievements in electron microscopy in three major areas: instrumentation and methods, materials science and life science. Plenary and invited lectures gave overviews on exciting new developments highlighting the application of new electron microscopy techniques in physics, chemistry, materials science, life and earth science.

Above 160 delegates from all over the world (Austria, Belgium, Czech Republic, Denmark, France, Germany, Great Britain, Hungary, Japan, Holland, Slovakia, Spain, Ukraine and USA) participated in the EM2011. During the conference 13 oral sessions took place and 49 presentations were given basically on electron, holography, tomography, HREM, STEM, EBSD, ED and precession techniques as well as their application in materials sciences and other related disciplines.

The organizers of the conference were honored to host such notable microscopists as Prof. Robert Sinclair, Prof. Rafal Dunin-Borkowski, Dr Martin Hÿtch, Prof. Wolfgang Jaeger, Dr Christoph Koch, Prof. Janos Labar, Prof. Michael Lehmann, Prof. Kenji Matsuda, Prof. Jean-Paul Morniroli, Prof. Wolfgang Neumann, Prof. Makoto Shiojiri, Dr Debbie Stokes, Dr Stefan Zaefferer and many more.

Apart from the oral sessions participants had the possibility to discuss their results during the poster sessions during which 78 posters were presented.

Furthermore, most of the cutting edge microscopy companies i.e. JEOL , COMEF (Hitachi), LABSOFT (FEI), ZEISS, OXFORD instruments, UNI-EXPORT (Tescan) MBSS (GATAN), AM Technologies Poland, EloService, NanoMegas installed and presented their new microscopes and other products in the conference booths.

The conference was particularly focused on spreading electron microscopy among young scientists. Therefore, the Polish Society for Microscopy as well as companies COMEF and GATAN funded the best abstract, the best poster and the best photo awards. During the conference delegates participated not only in the scientific events but also in social ones such as conference dinner, valley excursion and salsa music evening (funded by JEOL).

All microscopists from all over the world are kindly welcome to visit Poland at the next XV International Conference on Electron Microscopy (EM) which will be held in 2014.

ELECTRON MICROSCOPY AND ANALYSIS 2011 (EMAG) • BIRMINGHAM UK

Electron Microscopy and Analysis 2011
September 6-9, 2011
University of Birmingham, UK

The Electron Microscopy and Analysis Group of the UK Institute of Physics organises a biennial conference and trade exhibition. In 2011 this meeting was held during 6-9 September at The University of Birmingham. I must first take this opportunity of thanking Birmingham for hosting the conference, and the excellent support we have received from the local organisers. As a committee, we are delighted to see that enthusiasm for the EMAG conference series continues to be strong. We received more than 160 submitted abstracts, and 157 delegates attended the meeting.

The scientific programme organiser, Ian MacLaren, put together an exciting programme. Plenary lectures were presented by Professor Knut Urban, Dr Frances Ross and Dr Richard Henderson. There were a further 10 invited speakers, from the UK, Continental Europe, Australia, USA and Japan. The quality of the contributed oral and poster presentations was also very high. EMAG is keen to encourage student participation, and a winner and two runner-up prizes were presented for the best oral and best poster presentation from a student.

We must also thank our manufacturer and trade colleagues for their support for the trade exhibition which, despite the current financial pressures, sold well. We had 26 companies or organisations exhibiting. The EMAG committee has long taken the view that we use conference income, including from the trade exhibition, particularly to support young researchers. Student presenters at the conference, who are also IOP members, received a discount on their registration fee to reduce it to just £100.

The local organisers at Birmingham (Yu Lung Chiu, Ziyou Li and Ian Jones) enthusiastically organised an exciting 1.5 day Advanced School on Chemical Nanoanalysis which was appreciated by all those that attended. A conference dinner was held in the very pleasant surroundings of the Birmingham Botanical Gardens.

Finally I must thank the platinum sponsors for their support of the meeting. These were Gatan, Zeiss, FEI, JEOL and Hitachi. I must also thank the European Microscopy Society for their generous sponsorship and support for the travel costs of two invited speakers from Continental Europe.

Dinner at the Birmingham Botanical Gardens at the EMAG 2011 Conference

WIRMS 2011 • September 4-8, 2011 • Trieste, Italy

Young Life Scientists Ireland (YLSI) conference
November 12, 2011 • University College Dublin (UCD), Ireland

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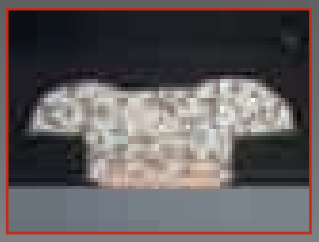
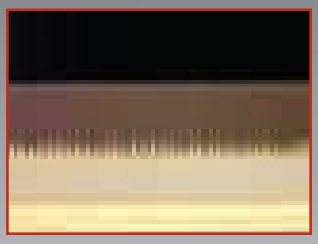


Solder Bump



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TEM Cross-Section of an IC

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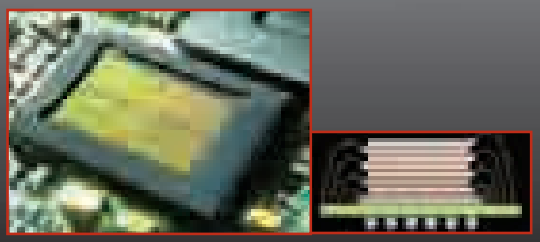

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REPORTS ON SPECIAL EVENTS

Notes :

SUPERSTEM : THE EPSRC NATIONAL FACILITY FOR ABERRATION-CORRECTED SCANNING TRANSMISSION ELECTRON MICROSCOPY

The EPSRC National Facility for Aberration-Corrected Scanning Transmission Electron Microscopy

by Andrew Bourne
(Head of Physical Sciences, EPSRC)
on Wednesday 11 January 2012

A drawing of the Super STEM building located at Daresbury

A Pioneering Facility

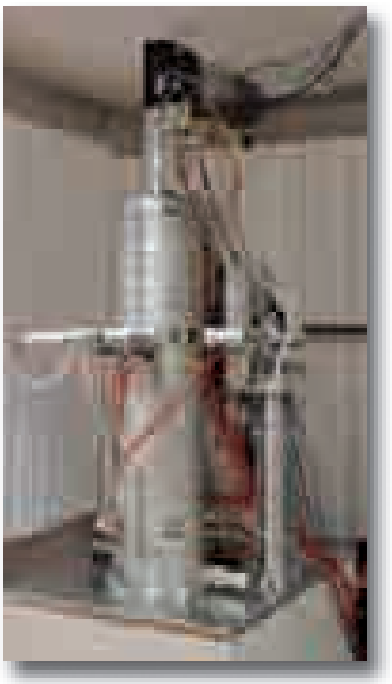
The world of electron microscopy has undergone a revolution in recent years with leaps in the performance of electron optical elements, sources and detectors. While instruments are becoming ever more powerful their complexity is also multiplied. This trend places renewed emphasis on national facilities that gather in one place state-of-the-art instrumentation and world-leading experts in the field. The SuperSTEM laboratory was one such pioneer, opening the frontiers of electron microscopy to the scientific community by becoming in 2003 the first user centre in the world to provide access to aberration-corrected microscopes. After a competitive tendering process, the SuperSTEM Consortium was recently awarded by EPSRC the status of National Facility for Aberration-Corrected STEM.

Consortium

The consortium, led by the University of Leeds and joined by the Universities of Glasgow, Liverpool, Manchester and Oxford, will manage and administer this National Facility. Revolving around its central hub on the STFC Daresbury Campus, the SuperSTEM facility brings together the scientific and technical expertise of world-renowned academics. It will provide U.K. researchers and their worldwide collaborators access to unique instruments, both on the Daresbury site and across its member institutions.

Inauguration Ceremony

To celebrate its launch, a ceremony will take place on Wednesday 11 January 2012, opening at 11am with inauguration lectures by Konstantin Novoselov (Manchester), Ondrej Krivanek (Nion), Christian Colliex (Orsay LPS) and Quentin Ramasse (SuperSTEM). These will be followed by addresses from Colin Whitehouse (STFC), Andrew Miller MP (Chair of Science & Technology Select Committee), and Graham Evans MP (both, parliamentary business permitting). The official opening of the facility by Andrew Bourne, Head of the EPSRC Physical Sciences Programme, will take place at 1pm. A lunch reception will be held thereafter.



Prof. Rik Brydson,
Institute for Materials Research & SuperSTEM,
SPEME,
University of Leeds,
Leeds LS2 9JT,
U.K.

Jany Thibault-Pénisson (1947 – †2011)

Jany Thibault-Pénisson (1947 – †2011)

On Thursday the 27th of October 2011, we were deeply saddened to learn that Jany Thibault has passed away. Jany was a renowned and highly respected researcher in the microscopy and materials science communities. She was nationally and internationally recognized for her work in transmission electron microscopy and in particular, for her contributions in the field of high-resolution imaging and plasticity.

Jany Thibault (- Desseaux then - Pénisson) was born in 1947. She spent her youth in Paris and then moved to Grenoble, where she graduated as an ingénieur at the Institut National Polytechnique of Grenoble. She began her scientific career at the CEA-Grenoble in 1974, conducting her thesis in the Department of Solid State Physics with Alain Bourret as supervisor. She was involved in the early development of high-resolution electron microscopy and in 1975 published her first results at high accelerating voltages. She then turned to observations at lower voltages of atomic columns in semiconductor materials, particularly in germanium. It is from this material that she achieved her first substantial results and recorded the first images of the cores of dislocations at the atomic scale, and thus revealed the dissociation of dislocations. She defended her PhD in 1977 by presenting these important results. She received the Prix Alain Brelot award from the French Physical Society in 1979 for her thesis.

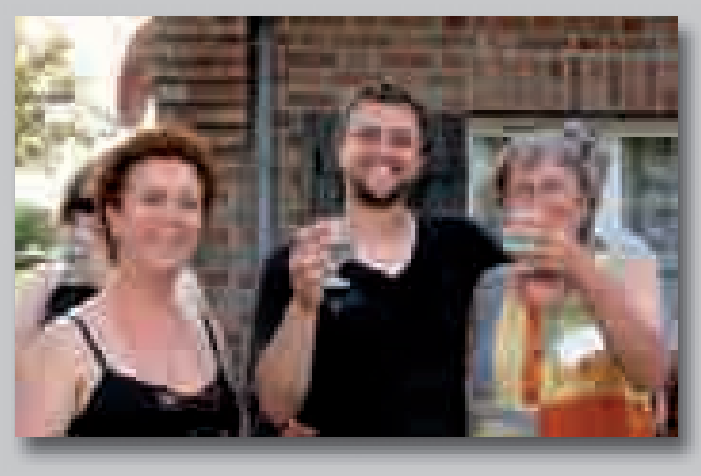
She was recruited by CNRS in 1978 and continued to work at CEA-Grenoble in the Department of Fundamental Research. She published the first comparison of the experimentally observed atomic scale displacements around an edge dislocation with elasticity theory calculations. In 1980, she showed that the method of separation for 60° dislocations in germanium and silicon was by glide, again a very important result for the community. As a natural continuation, she then focused on the atomic structure of grain boundaries in these semiconductors, and later in metals, and showed that these structures are often perfectly ordered. She was able to describe the different models consistent with the experimental high-resolution images. In 1983, she won the bronze medal of the CNRS.

In 1987, with two of her PhD students, Mohamed El Kajbaji and Jean-Luc Putaux, she began to study the interaction of dislocations with grain boundaries. This subject remained one her main research topics during the rest of her carrer. She assumed the direction of the electron microscopy group at the CEA-DRFMC and was appointed Director of Research at the CNRS.

During a diner in Nagoya (Japan)
On the left François Louchet, Daniel Caillard, Jean-Jacques Métois.
On the right Jany, Etienne Snoek

During a walk in a japanese garden
with several colleagues.
Jany, Pierre Stadelmann, Andrew Johnson
and Chunlin Jia

Fascinated by the microscope that can "see" atoms, Jany was always curious to understand how atoms arrange themselves next to one another, how they come together and organize themselves in defects. She investigated a variety of materials, such as metals and problems of relaxation in metallic multilayer systems (see for example, the thesis of P. Bayle-Guillemaud) and oxides. She also contributed to the understanding of early growth patterns for single-wall carbon nanotubes (CNT) by analyzing the interface between the catalyst and the CNT. In 1996, she introduced the emerging technique of energy filtering to perform chemical analysis at the sub-nanometre scale to her laboratory. She worked on many projects in nanomaterials, where her knowledge on the structure, defects and the behavior of interfaces was much appreciated.



During the special scientific day in honor of Jean-paul Morniroli in Lille (France). A toast to Jean-Paul with Jeanne Ayache and Florent Houdelier

In 2004, she decided to join the University Paul Cézanne in Marseille to lead and direct a major project for aberration-corrected high-resolution microscopy as part of the CIM-PACA platform and create the local network of quantitative microscopy MET-PACA.

Throughout her career, Jany Thibault has always been an ambassador of high-resolution microscopy, nationally and internationally. She was a regular invited speaker in major conferences focussed on electron microscopy and participated, throughout her career, in the training of young microscopists at many national and international schools in microscopy and materials. She was also involved in the redaction of monographs on grain boundaries in semiconductors and other materials.

Jany Thibault was a brilliant physicist and microscopist and is already deeply missed by our whole community. She was a woman of character that anyone who had the privilege of meeting her would not forget. Her knowledge, both scientific and cultural, was impressive and was always combined with a real humanity and "joie de vivre". She was also an artist, finding in painting and drawing a very personal way to express the world, but above all, she was a lover of mountains (hicking, climbing, skiing).

In addition to microscopy, Jany had three passions: rock climbing (Aiguebelette), mountaineering (Aiguille Tepey), and drawing.

We express our sincerest sympathy to her husband Jean-Michel Pénisson, co-worker and companion for life. Let him know that the reactions to the announcement of her departure have all reflected a deep sadness. Illness took her too soon; we keep a fond memory of an exceptional woman.

Alain Bourret, Pascale Bayle-Guillemaud, Marie Cheynet
(with the collaboration of her husband Jean-Michel Pénisson and several colleagues: François Louchet, Gianluigi Botton, Virginie Serin, Pierre Stadelmann)

LAUNCH OF UNIQUE TITAN^3 G2 60-300 ELECTRON MICROSCOPE IN KRAKOW

The International Centre of Electron Microscopy for Materials Science

at the AGH University of Science and Technology in Krakow has launched the unique Titan^3 G2 60-300 electron microscope

In continuation of more than 50 years long tradition of electron microscopy at the AGH University of Science and Technology in Kraków, the International Centre of Electron Microscopy for Materials Science (IC-EM) has developed its infrastructure. On 13th of October 2011, during the conference dedicated to scientific co-operation between Poland and North-Rhine-Westfalia, the IC-EM inaugurated the third in the world ultimate performance analytical electron microscope, a Titan3 G2 60-300 with ChemiSTEM technology. This microscope offers a 70 pm resolution in imaging and EDX mapping microanalysis in probe corrected STEM at high (300 kV) and low (60 kV) accelerating voltage.

Titan^3 G2 60-300 microscope installed in the International Centre of Electron Microscopy for Materials Science (IC-EM)

The purchase of the microscope was supported by the Structural Funds of the European Union within the Innovative Economy Programme administrated by the Ministry of Science and Higher Education in Poland. An open tender led to choose the FEI company and the contract for supply of the microscope was signed in October 2009. The designing and reconstruction of the dedicated environmentally shielded room for the new microscope took two years and was completed in May 2011. The microscope was shipped from Eindhoven to Krakow in May 2011 and successfully installed in summer.

The IC-EM team and the FEI representatives during installation of the new microscope

The Titan^3 G2 60-300 analytical microscope is equipped with new X-FEG Schottky high brightness source with a monochromator. It gives an extreme high spatial and energy resolution. A high resolution STEM-HAADF unit with the new dodecapole DCOR probe Cs corrector and the ultra sensitive new ChemiSTEM EDX system, based on four windowless Silicon Drift Detector (SDD) technology, gives the highest spatial atomic resolution EDX mapping with enhanced acquisition efficiency and high speed for low dose (0.7 sr collection angle).

The EDX mapping capabilities at the atom column level can be used even for beam-sensitive materials like perovskites. With a 20 to 50 times gain in efficiency and a windowless design it constitutes a revolution for materials science. The EDS analysis or mapping will supersede EFTEM in numerous situation (ease of EDS vs EELS, inadequate EELS edges, sample thickness) and extend the efficiency of EDX toward light elements.

Moreover, 3D EDX investigation becomes practicable in a reasonable time scale. Additionally, the new Titan in IC-EM is equipped with EELS Quantum 693 spectrometer for edge shifts/fine structure using monochromator and probe Cs corrector, new FEI precession electron diffraction system, Lorenz lens, rotatable biprism for off-axis electron holography and TARO for full remote access operation.

The Titan3 G2 60-300 in the IC-EM enables the application of different TEM techniques for materials science investigation, namely:

- structural defect analyses using diffraction contrast (BF/DF/WB), HRTEM and EDX,

- phase identification at the nanoscale using precession electron diffraction (PED), nanodiffraction, HRTEM/FT diffractograms, STEM/DF and EDX,

- low-dose low voltage EDX microanalysis for beam-sensitive materials (Titan 60kV, ChemiSTEM),

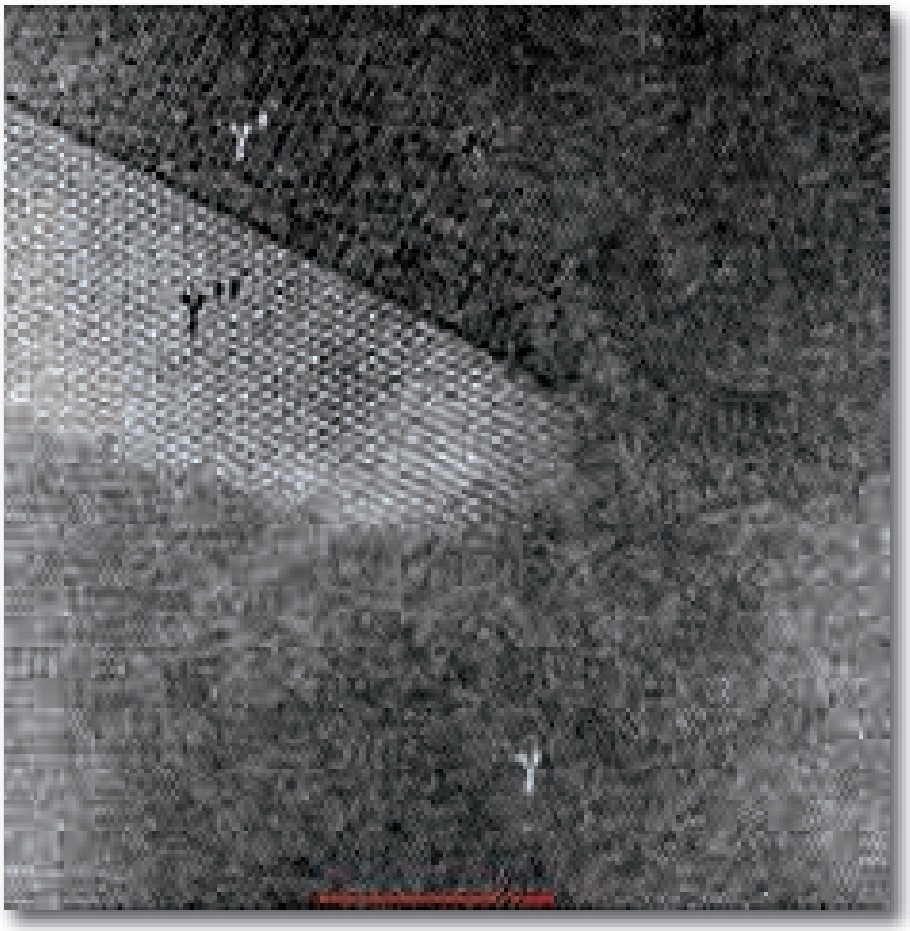
- new PED capabilities at low accelerating voltage as well as new parallel intensity recording on Titan 60-300 taking advantage of X-FEG and monochromator,

- orientation mapping in 2D and 3D using the FEI PED/Titan with, in particular, a higher spatial and/or angular resolution.

- TEM/EFTEM, STEM/HAADF and STEM/EDX tomography.

Official opening of the International Centre of Electron Microscopy for Materials Science at the AGH University of Science and Technology in Kraków

The new microscope allows the IC-EM staff to perform research projects on various materials for energy systems, aeronautics and automotive industry, electronics, biomedical engineering, nanomaterials, graded and multi-layered materials, structural and functional materials, etc.



HRSTEM-HAADF image of the γ' and γ'' precipitates in the nickel-base superalloy for aeronautics (K. Kulawik, I. Alexandrou)

At present, the IC-EM plays the role of a TEM training site for Central and Eastern Europe and collaborates with many research partners, providing an access to electron microscopy. The wide collaboration of the IC-EM with research and industrial partners will stimulate the exploitation of this advanced instrument on the highest level of performance.

Acknowledgements

The IC-EM staff acknowledges the supporting of the purchase of the Titan3 G2 60-300 microscope by the Structural Funds of the European Union within the within the priority 2.1 of the Innovative Economy Programme administrated by the Ministry of Science and Higher Education in Poland, project nr POIG.02.01.00-12-016/08.

Aleksandra Czyrska-Filemonowicz
Head of the IC-EM

Noël Bonnet (1947 – †2011)

Noël Bonnet (1947 - †2011)

Noël Bonnet passed away on Saturday, Oct. 22, following a long and valiant battle with illness. He had just turned 64. A physicist by training, Noel Bonnet was instrumental in advancing biological research in the field of image analysis including electron microscopy. Among his numerous contributions in the field of biological imaging, he was one of the first to promote a multivariate statistical approach to image analysis by X-Ray Spectrometer Transmission Electron Microscopy. So Noel was able to show that, by cryo-preparation of tissues, the principal component analysis allows direct visualization of the correlation between diffusible elements in different cellular compartments. He also successfully applied this approach of multivariate statistical analysis to filtered images with a loss of energy. Noel also worked on the development of digital filters for the detection of trace elements in EELS spectrometry to name just a few of his contributions. His work often serves as a bridge between the worlds of microscopy and optical and electronic signal processing. He has been a researcher who was greatly appreciated by many units within INSERM which he belonged to in Reims where he leaves a strong tradition of multidisciplinary collaboration.

Noel Bonnet has actively participated in the life of our scientific society (SFME at the time) since he joined the Council in 1987. It was under his leadership that the "Bulletin of the SFME" was created and whose first issue was published in the Fall of 1987. This newsletter was published every two years and served as a link between members and the Council; it was a source of information and a forum for debate. For example, in 1989 Noel and Dominique Ploton launched the great debate regarding the change of the name of SFME to better reflect the evolution of its activities. This was done later in 1996 with the creation of the SFμ. He continued to be the creator of the newsletter until 1991. Known for his scientific expertise, his talent as a teacher and his willingness to share his knowledge, he has led many schools and thematic workshops related specifically to the interests of the Congress of the Society.

A tribute to Noel Bonnet cannot omit his role as a teacher, the transmission of knowledge was for him an essential duty. As a Professor at the IUT of Reims, discretion, kindness and courtesy made him a popular teacher among his students. He has trained a large number of students and inspired many others. 4 years ago, Noel had retired in order to devote himself more fully to his many other passions, such as bridge, Petanque, and long (very long) hikes.

The following is a beautiful tribute to Noel written by one of his former students, as he will remain in our memories not only for his simple and just words: "but also for the great human and social values that shone within Noel, and his great sensitivity and attention to the world. With his height and his white hair, his unwavering smile and an almost British humor, it is a humanist of modern times who is leaving us, one of those who has prepared many of us to enter the 21st century. "

Daniel Thomas
Jean Michel

Noël enjoying a breakfast out on the terrace of the guest-house, he shared with Marie Cheynet (CNRS Grenoble in the middle of the photos), Virginie Serin (CEMES Toulouse, on the right) and Gianluigi Botton (CCEM-McMaster University Canada, on the right), during the Nanoanalysis school organized in Cargèse (Corse-France) by Christian Colliex in the course of 2000.

CELEBRATIONS OF THE TURKISH SOCIETY FOR ELECTRON MICROSCOPY

TURKISH SOCIETY FOR ELECTRON MICROSCOPY

20th National Electron Microscopy Congress has been organized in Antalya, Turkey between 25-29 October 2011 by Turkish Society for Electron Microscopy. During the congress 40th year of foundation of the "Turkish Electron Microscopy Society" has been celebrated.

20th National Electron Microscopy Congress has provided a scientifically rich and privileged environment with the attendance of 320 national and international scientists and young microscopists from both biological and materials sciences. Prof. Dr. Barry CARTER (President of International Federation of Societies for Microscopy (IFSM), USA); Prof. Dr. Nick SCHRYVERS (Secretary General of European Microscopy Society(EMS, Belgium); Prof. Dr. Joachim MAYER (Member of Executive Committee of EMS, Germany); Dr. Debbie STOKES (President of EUROPEAN MICROSCOPY CONGRESS 2012 UK); Prof. Robert OSAMURA (President of International Federation f Societies for Histochemistry and Cytochemistry (IFSHC), Japan); Prof. Dr. Pavel HOZAK (Member of Executive Committee of EMS -President of International Congress of Microscopy 2014, Czech Republic); Prof. Dr. Margit PAVELKA (Vice president of Austrian Electron Microscopy Society, Austria); Prof. Dr. Peter VANDENABEELE, Belgium; Dr. Paul VERKADE, United Kingdom, Dr. Saso STURM, Slovenia; Wim BUSHING, Holland, P.GNAUCK, Germany; T SALGE, United Kingdom and Assoc. Prof. Ümit KAYIŞLI (USA). 28 young researchers had been awarded with 'travel and registration grants' by the support of Scientific and Technological Research Council of Turkey (TUBITAK).

"Turkish Electron Microscopy Society Microscopy School" has been organized prior to the the congress in October, 24, 2011 with 26 participants.

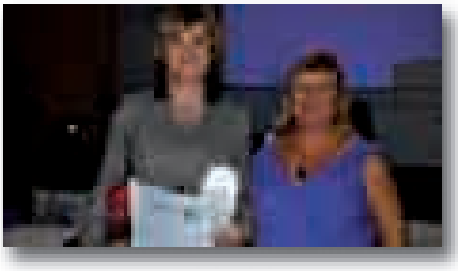
'Prof. Dr. Turkan Erbengi Reseach Award 2011' has been presented in the fields of biological sciences and material sciences. Prof. Dr. Üveis Maskar Biological Sciences Best Poster Award, Prof. Dr. Şadi Karagöz Materials Sciences Best Poster Award and Best Picture Award has been awarded during 20th National Electron Microscopy Congress.

Twenty members of Turkish Electron Microscopy Society had attended and presented their scientific researches at the 10th Multinational Congress on Microscopy 2011, Urbino, Italy. Following a presentation in 'Multinational board' about Turkish Society for Electron Microscopy, The Society has been accepted as 'Invited Society' to the organization of '11th Multinational Congress on Microscopy ' which will be held in Regensburg Germany. In 2010-2011, periodic scientific meetings of the Turkish Electron Microscopy Society have been organized in 9 different microscopy centers of Turkey. 'Symposium on Biomaterials' has been held in December 2010 in Acıbadem University, Istanbul with an attendance of 120 scientists from both biological and materials sciences.

Turkish Society for Electron Microscopy will collaborate in the organization of 'Workshop on Fluorescence Microscopy in Modern Cell Biology and Human Disease' with international participation during August 2012 in Istanbul Turkey.

Microscopy School, October, 24, 2011

20th Electron Microscopy Congress, October 25-28, 2011



Award Ceremony from 20th Electron Microscopy Congress,

Symposium on Biomaterials December, 26, 2010

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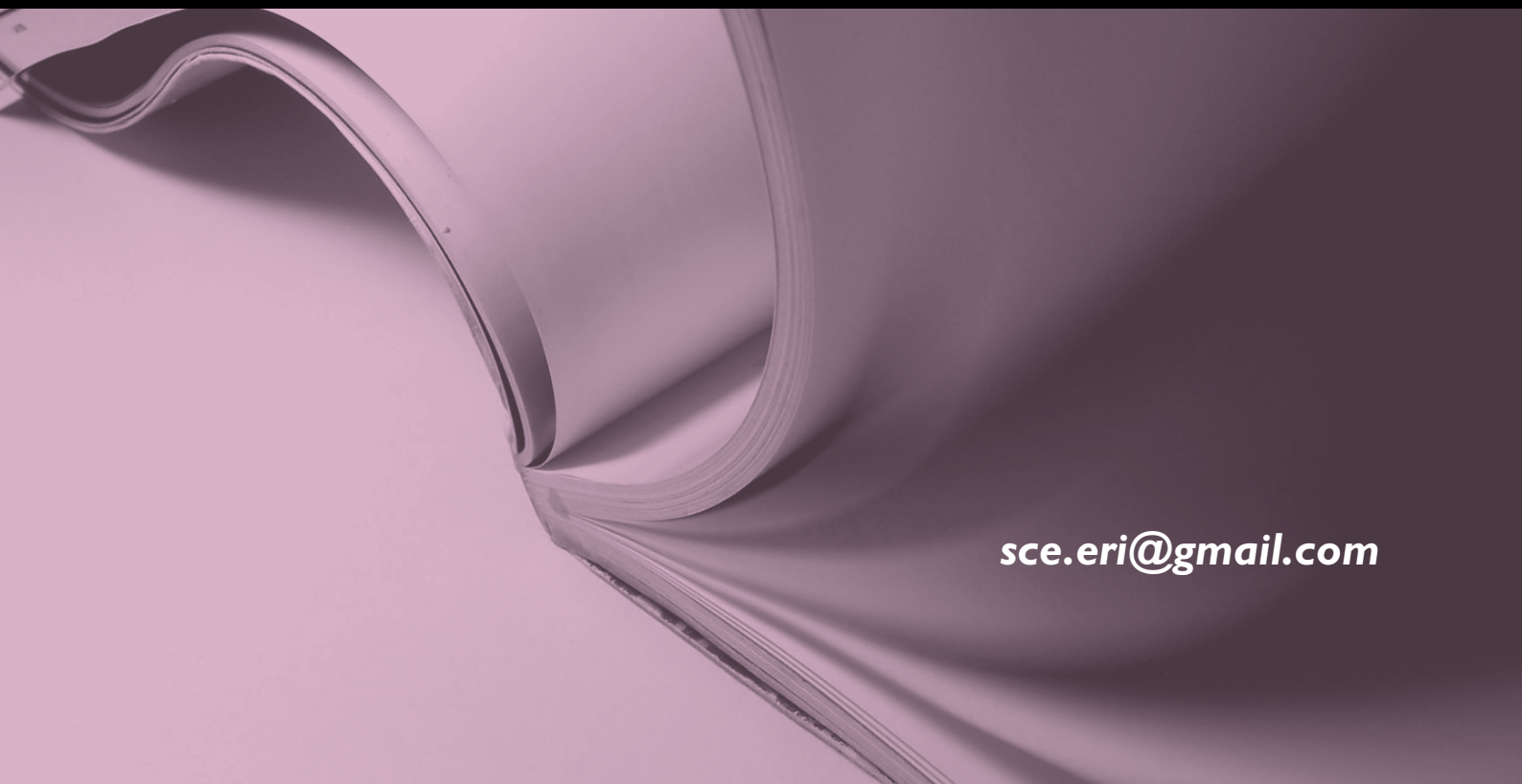


REPORTS ON SCHOLARSHIPS

Notes :

SCHOLARSHIPS

In 2011, 24 scholarships of each 250 € were awarded for partipation at one of the EMS extensions. An individual application to attend to a microscopy school has also been granted. Let us remind you that any young EMS members can apply for a scholarship. Criteria of eligibility are set out at the website http://www.eurmicsoc.org/scholarships.htm.

Kiel Germany MC 2011 – August 28 – September 2

Name	EMS member	Society	Lab & Country
Haiyan Tan	Yes	BSM	EMAT, University of Antwerp, Belgium
Bart Goris	Yes	BSM	EMAT, University of Antwerp, Belgium
Annick De Backer	Yes	BSM	EMAT, University of Antwerp, Belgium
Gerardo T Martinez	Yes	BSM	EMAT, University of Antwerp, Belgium
Christian Wiktor	Yes	BSM	Universities of Bochum (Inorganic Chemistry II) and Antwerp (EMAT)
Iryna Andrusenko	Yes	Individual	Institute of Physical Chemistry, Mainz, Germany
Vanessa Zheden	Yes	ASEM	Cell Imaging and Ultrastructure Research, University of Vienna, Austria
Herbert Reingruber	Yes	ASEM	Institute for electron microscopy and fine structure research, Graz, Austria
Felix von Cube	Yes	DGE	Physikalische Institut Bonn, Germany
Sebastian Tacke	Yes	DGE	Institute for Medical Physics und Biophysics EMA, Muenster, Germany
Leopoldo Molina-Luna	Yes	BSM + DGE	EMAT, University of Antwerp, Belgium

Urbino Italy MCM 2011 – September 4 -9

Name	EMS member	Society	Conference	Lab & Country
Eudri Venter	Yes	RMS	MCM2011	Department of Genetics,University of Pretoria, South Africa
Marzia Giagnacovo	Yes	SISM	MCM2011	Dept. of Animal Biology, University of Pavia, Italy
Tanja Visnjar	Yes	SDM	MCM2011	University of Ljubljana, Faculty of Medicine, Slovenia
Manuela Costanzo	Yes	SISM	MCM2011	Cell Biology and Neurobiology, Università degli studi di Pavia, Italy
Amy Wang	Yes	BSM	MCM2011	EMAT, University of Antwerp, Belgium
Jelena Rajkovic	Yes	SSM	MCM2011	Department of Biology and Ecology, University of Nis, Serbia
Neerushana Jehanathan	Yes	BSM	MCM2011	EMAT, University of Antwerp, Belgium
Zuzana Kubinova	Yes	CSMS	MCM2011	Department of Experimental Plant Biology, Charles University in Prague
Zuzana Burdikova	Yes	CSMS	MCM2011	Institute of Physiology, ASCR
Hui Shi	Yes	BSM	MCM2011	EMAT, University of Antwerp, Belgium
Alena Michalcova	Yes	CSMS	MCM2011	Institute of Chemical Technology Prague, Czech Republic
Sanja Milosevic	Yes	SSM	MCM2011	Faculty of Physical Chemistry, University of Belgrade, Serbia

RMS Electron Microscopy Summer School 2011 Leeds, UK - July 4-8

Megha Dubey	Yes	RMS	TEM school	Groupe de Physique des Matériaux Rouen University Fr

Short reports from awarded students, The Microscopy Conference MC2011

Reports from students who received a scholarship from EMS to The Microscopy Conference MC2011 • Kiel - GERMANY (28th August – 2nd September)

Gerardo Tadeo Martinez Alanis

EMAT – University of Antwerp (Belgium)

The Microscopy Conference MC2011 held in Kiel, Germany, from the 28th of August to 2nd of September was my first opportunity to attend a conference in Europe and also, the first one during my PhD studies. Although the conference was organized in three major topics: Materials Science, Instrumentation and Methods and Life Sciences, I found out a wide variety of topics in the field of electron microscopy that made it very interesting and motivating. The organization and place of the conference promoted an easy way to attend the lectures and build up new relationships in the field.

In my case, I was given the chance to present my work by means of a poster. It was a very nice experience, since it allowed me to discuss my results on a face-to-face basis, which I find very useful, since the topic is easier to explain and the discussion is not limited to one question. I was satisfied to get good reviews and feedback about the work I have been doing. It also allowed me to meet more people that are doing research in similar topics and compare and discuss different approaches to solve similar issues of research. I am very grateful with the EMS for the given support through a grant and for my advisors, so I could participate in such an important event.

Iryna Andrusenko

Johannes Gutenberg University, Mainz (Germany)

This year The Microscopy Conference MC2011 was held in Kiel, Germany. The weather was not very pleasant and the rain was waiting for us every day, but the atmosphere in the lecture halls was extremely friendly and fully compensated all weather drawbacks.

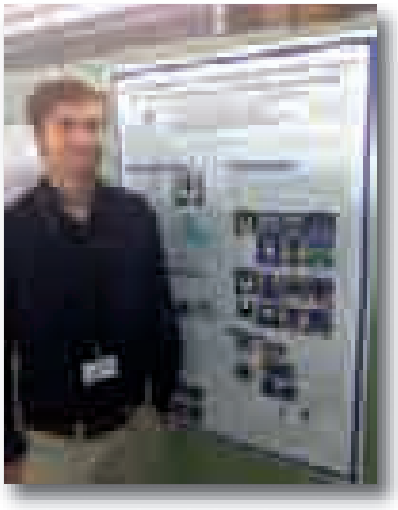
For me as a young scientist, it was quite interesting to exchange ideas with other students from different universities. Moreover, I found that it is very important to have the possibility to meet well-known researchers from different parts of the world. I was excited to attend their wonderful and extremely interesting talks. During the conference I also had the chance to attend a number of fascinating presentations and workshops. Actually, attending the MC2011 gave me the opportunity to learn more about my main fields of interest and attend sessions connected with neighbouring scientific areas like Holography, Life Science, Metal Alloys…

I would like to thank EMS for the scholarship which allowed me to present my recent results on structural investigation of (Na,K)2O-Al2O3-WO3 systems. I am sure this experience will be very helpful for my future studies.

Von Cube

Forschungszentrum caesar, Bonn (Germany)

As a new member of the EMS and the whole Electron-Microscopy-Community, the MC 2011 was the perfect occasion for me, not only to get a overview of the different fields in Electron Microscopy, but also -and this is even more important- to get in touch with other scientists. At the numerous postersessions I had many fruitful discussions, concerning on the one hand my



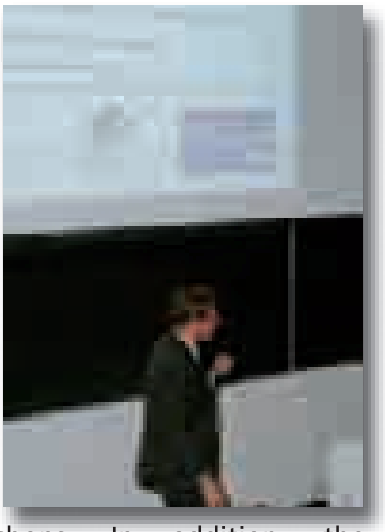
own topic, where I got lots of thought-provoking impulses and on the other hand, concerning (to me) completely new topics, where (as I hope) I had the chance to trigger some thoughts. Thanks to the lecture sessions I was able to see and hear people and topics, which I only knew from some papers. In some cases, when the speaker talked about a topic connected to mine, I had the opportunity to keep a conversation with him after the session, where we discussed (I should better say: where he explained) parts of the talk I didn't understand. During the breaks and the evening events I also had the possibility to get acquainted with some people on personal level and I must say, that I was surprised of the casual mood of the participants at the conference dinner. From former conferences I was used to a kind but reserved attitude. To see so many of my colleagues dancing, astonished me, but made the community even more simpatico.

I was particularly happy about the resonance on my own poster. That includes of course the award for the best poster, but also the feedbacks at the conference and the numerous questions even after the conference.

All in all I'm very happy that I was part of the conference and I'm more than thankful for the support of the EMS.

Sebastian Tacke

University of Muenster (Germany)



First of all, I would like to thank the EMS for the financial support, which enabled me to join the MC 2011 in Kiel. Due to the appreciating efforts by the organisers this conference became a versatile meeting with an enormous number of outstanding lectures and valuable workshops. In addition, the comprehensive program of the conference was complemented by interesting poster presentation sessions. With the participation in the MC 2011, I had the opportunity to learn about the latest improvements, developments and new trends in the field of electron microscopy in life science. Especially, the oral presentations about cryo-electron microscopy and serial block-face scanning electron microscopy left a lasting impression on me. These new impressions and the exchange of experience during the workshops will contribute to my work in a fertile manner. Furthermore, there was plenty of room for discussions in order to establish new collaborations and contacts. In summary, it can be stated that the participation in MC 2011 was of great benefit in terms of my prospective tasks. With these experiences, I am looking forward to emc2012 in Manchester.

Short reports from awarded students Multinational Congress on Microscopy 2011

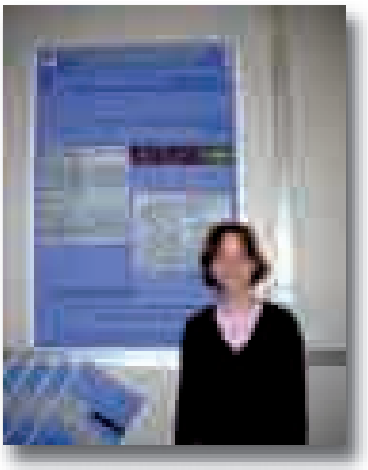
Reports from students who received a scholarship from EMS to 10th Multinational Congress on Microscopy 2011 • Urbino, Italy • 4th – 9th September

Amy Wang
EMAT – University of Antwerp (Belgium)

I gave a lecture in MCM2011 about our latest research results with the support from EMS. Many showed positive interests in our work and came with questions after the lecture. I mainly followed the plenary lectures and lectures in materials science and instrumentation and methodology. In these lectures, general overviews or recent results from (S)TEM were presented. In particular, 3D tomography has drawn a great interest in all fields and many presented interesting results from various materials. Moreover, the congress was held in a wonderful historical city and it seemed that many, including myself, enjoyed walking along the steep roads and alleys that lead to every attraction around the city.

Marzia Giagnacovo
University of Pavia (Italy)

I am Marzia Giagnacovo, attending the PhD curriculum in Cell Biology in the Laboratory of Cellular Biology and Neurobiology, at the Department of Animal Biology, University of Pavia (Italy). My present scientific interests concerns skeletal muscle atrophy in sarcopenia in Mammalian species, and in human myotonic dystrophy type 1 and 2; in my research work, I am mostly using cytochemical techniques at fluorescence and electron microscopy.



I am greatly indebted to the EMS for the scholarship that allowed me to attend the 10th Multinational Congress on Microscopy (MCM 2011) in Urbino, where I have presented two posters: **Ultrastructural study of the ageing *in vitro* of myotubes derived from myoblasts of patients affected by myotonic dystrophy type 2** (M. Giagnacovo, M. Costanzo, M. Malatesta, R. Cardani, G. Meola and C. Pellicciari) and **Immunolocalization at electron microscopy of the senescence-related protein, terminin in human fibroblasts** (M. Giagnacovo, M. Malatesta, P. Veneroni and C. Pellicciari).

This was my first experience at an MCM and I found the congress very well organized and highly stimulating: besides the plenary lectures and oral presentations, I really appreciated the presence, every day, of poster sessions which allowed me to discuss my results not only with other young students but especially with qualified and experienced scientists. I am sure that these contacts will be valuable for the progress of my research.

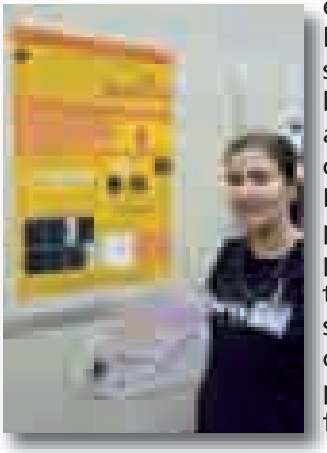
I wish to thank Prof. Elisabetta Falcieri and her group for the perfect organization of this conference, which I have appreciated both for the scientific and the social program (Urbino's visit by night was an unforgettable experience).

I look forward to attending the next 11th MCM, in 2013.

Zuzana Kubinova
Faculty of Science, Charles University in Prague (Czech Republic)

From the 4th to the 9th of September I attended the 10th Multinational Congress on Microscopy 2011 in Urbino, which was an EMS Extension. I am a PhD student and this was the first time I took part in an international scientific conference. My participation was supported by the European Microscopy Society scholarship - I would like to thank the EMS very much. I had an

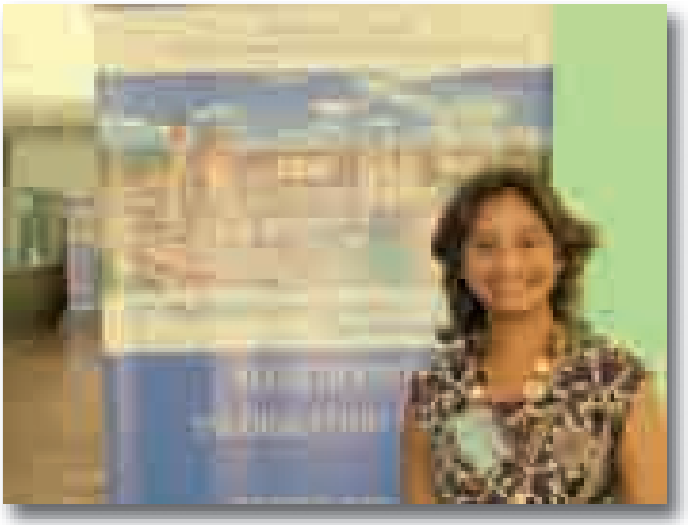
opportunity of presenting my own results from my ongoing PhD research (Comparison of different methods of chloroplast number estimation in mesophyll cells) and to discuss them with experienced scientists every day during the poster sessions. It was a valuable experience for me. The lectures were held by scientists of various fields of knowledge, so I have learnt a lot about many topics connected with microscopy. Moreover, the congress took place nearby a well-preserved Italian medieval town of Urbino. Its narrow steep streets, brick houses, cathedral and monumental palace will never disappear from my mind.



Neerushana Jehanathan

EMAT – University of Antwerp (Belgium)

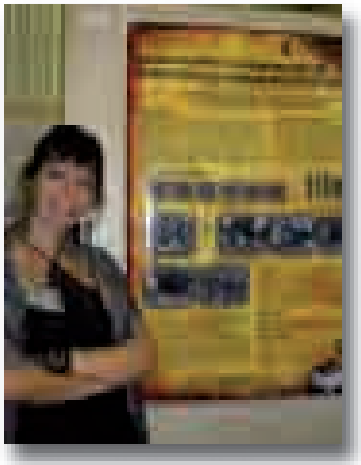
I am very grateful to EMS for supporting me to attend the MCM 2011 conference in Urbino. I had an oral presentation in the materials science section and it was very fruitful to be able to present some of my work and receive comments, questions and feedback from an audience with similar fields of interest. The scientific campus (Sogesta) in Urbino has a marvellous background setting for the conference. Scientific discussions amidst the rolling hills and medieval surrounding were indeed an added bonus. I am content that I got this splendid opportunity to meet and communicate with various researchers from around the world and share our scientific interests, my work, and learn about their research as well. A wide range of topics were presented at the conference which was very interesting and also gave me an insight into the current 'hot' topics related to microscopy and materials science in general. On the whole, it was a great experience and I wish to sincerely thank EMS again for the scholarship.



Jelena Rajkovic

Department of Biology and Ecology
Faculty of Science and Mathematics
University of Niš (Serbia)

After completing the 10th Multinational Congress on Microscopy 2011 in Urbino, Italy, I am pleased to inform you that everything went well and that we came back satisfied and full of impressions. During five days, we were able to attend numerous lectures from different sessions (Instrumentation and methodology, Life sciences and Materials Science) and see plenty of posters which were displayed every day. I was particularly pleased to meet a lot of young and ambitious people and especially familiar faces from past conferences.



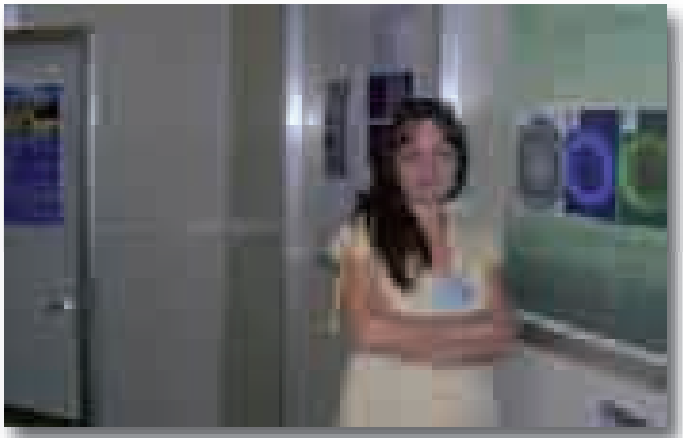
I presented a poster within the Life Sciences, entitled "Propolis effect on morphology of human gingival fibroblasts in vitro". The poster has been awarded and I take this opportunity to thank everyone who supported this research in any way.

I would like to thank you, EMS, for giving me scholarship thus enabling me to attend this event. It has been professionally a very valuable experience but also a lot of fun.

Dragana Rancic

University of Belgrade Faculty of Agriculture
(Serbia)

Thanks to EMS who provided me a scholarship of 250 Euro I was able to attend the 10th Multinational Congress on Microscopy (MCM 2011) in Urbino, Italy, from Sept. 04th to 09th 2011. The EMS scholarship has not only helped me to cover part of my travel



expenses, but also gave me a personal sense of satisfaction and respect knowing that EMS so graciously takes care of young scientist and supporting them in improving their scientific experience.

For me, this was a great opportunity to meet with other scientists from the same field of research and to discuss with them and to learn more about effective oral and poster presentations of scientific results. Also, this was a chance for me to introduce myself with the new trends in microscopy science, new experimental methods, instruments for sample preparations and software for image analysis. This was a very interesting experience for me, the congress was very well organised and the picture of Urbino town and beautiful panoramic view of its surrounding will be for a long time in my memory.

Manuela Costanzo

University of Pavia (Italy)

I am a young graduate student in the Laboratory of Cellular Biology and Neurobiology, University of Pavia (Italy).
I was awarded by the EMS scholarship to participate to the 10th Multinational Congress on Microscopy (MCM 2011), in Urbino. I presented the poster "RNase A-containing foci are found in nucleoli of HeLa cells aged in culture". I utilized transmission electron and fluorescence microscopy to localize RNase A in the nucleolus in control and aged HeLa cells.

I thank EMS because I had the possibility to participate at this congress. I was excited because MCM has been my first congress and I could meet many young students, researchers and professors from different countries; in particular during poster sessions. At MCM there were researchers studying in various fields using different methods and this gave me a real impulse for further work. The quality of the talks was excellent and the oral presentations gave me the possibility to improve my knowledge in microscopy sciences. I'm interested in life science, but during the plenary sessions I could learn something about materials science, although it wasn't easy to understand these topics.

I would like to thank also Prof. Elisabetta Falcieri and her collaborators for the excellent congress organization, particularly for the attention paid to young researchers. In fact, the low registration fees allowed numerous young researchers to join the MCM. I look forward to participating to the next multinational congress on microscopy in 2013 to present my new results.

Tanja Visnjar

Faculty of Medicine, University of Ljubljana (Slovenia)

I am a PhD student at the University of Ljubljana, Faculty of Medicine, Slovenia, EU, working as a researcher under the mentorship of Assist. Prof. Mateja Erdani Kreft at the Institute of Cell Biology. With the support of an EMS scholarship I had the opportunity to participate at the 10th Multinational Congress on Microscopy 2011 in Urbino, Italy.
It was a great pleasure to stay in the really idyllic city of Urbino in Italy, from which the Campus and hills were seen. During the congress I came up to date with the latest findings from the field of instrumentation and methodology, live science and materials science. The scientific program contained more than 320 abstracts from different topics where microscopy represents an important part of the research. Because of this wide program I got insight into the present applicability of microscopy.

At this multinational congress I had the privilege to hear and to meat outstanding scientists from all over the world. It was a unique opportunity to exchange experiences with the top experts in microscopy in person and to meet other PhD students and young scientists that represented their work.

During the congress my work was shown on a poster, where the new information on regeneration of blood-urine barrier in bladder was represented. Until now my work was based on fluorescence microscopy, transmission electron microscopy, scanning electron microscopy, transepithelial resistance measurements and western blotting. However, during this congress I got some tips and tricks to improve my further work, which hopefully can be represented at the next MCM congress.

Alena Michalcova
Institute of Chemical Technology Prague
(Czech Republic)

In the beginning of September, I have attended the 10th MCM 2011 congress in the beautiful city of Urbino in Italy. I came to Urbino on 3rd September to have enough time for sightseeing and absorbing the atmosphere of this renaissance town included in the UNESCO Cultural Heritage List. I was absolutely amazed. Because of this I really appreciated the lecture about Urbino's history given by Dr. L. Bedini on the very first day of the congress.

On Monday the 5th of September, the scientific program of the congress started. Every morning, we began with two plenary lectures from different scientific fields. I personally like these lectures, because it extends my overview and gives me a short look into other fields. As it is usual for microscopy conferences, the program was divided into three sections – Life Sciences, Instrumentation and Methodology and Materials Sciences. Based on my scientific background, I have attended mostly the lectures in the Materials Sciences and Instrumentation and Methodology sessions. All lectures I have seen were very interesting. Naturally, the most helpful lectures for my work were in sections M8. Microscopy in cultural heritage, I7. Advances in sample preparation techniques and M5. Metal alloys and intermetallics. After the lectures, we have arranged some possible collaborations. I am hoping that they will fulfil in the future.

I have presented the results of my work in a form of three posters - Evolution of AlCr5.5Fe2Ti1 Alloy Structure during its Compaction, Microscopic Study of Paper Deacidification Process, Microscopic Documentation of Wood Damage Caused by Preservatives Based on Inorganic Compounds. The first of them was awarded a poster award at the Congress Gala Dinner. To conclude, for me MCM 2011 was a very successful congress and I want to thank EMS for supporting my attendance.

Short report from awarded student Electron Microscopy Summer School 2011

Reports from students who received a scholarship from EMS to Electron Microscopy (EM) Summer School organized by Royal Microscopy Society (RMS) • Leeds, UK • 4th – 8th July

Ms. Megha N. Dubey
Groupe de Physique de Matériaux
UMR 6634 CNRS
Université de Rouen,
France.

Electron Microscopy (EM) Summer School organized by Royal Microscopy Society (RMS) was held in Leeds from 04th-08th July 2011; the course organizer was Prof. Rik Brydson (University of Leeds).

The course was categorized in three streams:

1) Biological EM (SEM and TEM);
2) General SEM and TEM for Physical Scientists;
3) Advanced TEM.

I am a PhD student working on a thesis entitled "Kinetics and Mechanism of High-Temperature Oxidation of α-Bronzes", where an important part of my study is concentrated on microstructural investigations of specimens using electron microscopy techniques.

It has been a great experience to revise fundamentals as well as learn advances in Electron Microscopy during this summer school. The staff has taken best efforts to make a novice understand the basics, with due discussions on each question aroused by attending members and practical demonstrations.

I had chosen "Advanced TEM" course since it is in the interest of my study. It involved some sections of introductory lectures on optical microscopy, SEM, TEM, vacuum systems, image recording and sample preparation techniques and demonstrations. The course was then followed by dedicated lectures on advanced TEM which included High Resolution (HR)-TEM, Scanning (S)-TEM, Electron Energy Loss Spectroscopy (EELS), Energy Dispersive Spectroscopy (EDS), Energy Filtered (EF)-TEM and finally ended by a special lecture on Electron Tomography. All the lectures were accompanied by practical hands-on demonstrations on each specialized technique and problem solving on a one-to-one basis.

This school has been very useful for my work. With available facilities in our laboratory like TEM - JEOL ARM 200F, JEOL 2000 FX, this experience will help me in many ways for conducting better experiments with good understanding and analysis of results.

I would like to thank the European Microscopy Society (EMS) for providing me this scholarship and the Université de Rouen for providing necessary funding, and giving me the opportunity for benefiting and extending my scientific knowledge. I would highly recommend this course for people who are interested to learn the basics as well as gain advance information on Electron Microscopy.

REPORT ON OUTSTANDING PAPER AWARD

STATUS REPORT OF emc2012 MANCHESTER

REPORT FROM THE TREASURER

EUROPEAN MICROSCOPY SOCIETIES

EUROPEAN CORPORATE MEMBER ASSEMBLY (ECMA)

EMS CALENDAR 2012

APPLICATION FORMS (MEMBERS - ECMA)

2010 EMS OUTSTANDING PAPER AWARD

In 2010 EMS started a new initiative to support microscopy research by inaugurating the EMS Outstanding Paper Award. By the deadline of January 15, 28 papers had been nominated with a majority in the field of the Life Sciences. The jury*, chaired by Rik Brydson as non-voting member of the EMS Executive Board, selected a winning paper for each of the three categories of the Award, in time to be confirmed by the EMS Board meeting on March 16/17 in Antwerp. The following papers received the 2010 EMS Outstanding Paper Award in the respective categories:

1. Instrumentation: "Production and appliation of electron vortex beams", Nature 467, 301-304 (2010) by Jo Verbeeck, He Tian & Peter Schattschneider, doi:10.1038/nature09366

2. Materials Sciences: "Interpretation of electron diffraction patterns from amorphous and fullerene-like carbon allotropes", Ultramicroscopy 110, 815–819 (2010) by Zsolt Czigany & Lars Hultman, doi:10.1016/j.ultramic.2010.02.005

3. Life Sciences: "Superresolution Imaging of Chemical Synapses in the Brain", Neuron 68, 843-856 (2010) by Adish Dani, Bo Huang, Joseph Bergan, Catherine Dulac & Xiaowei Zhuang, doi:10.1016/j.neuron.2010.11.021

Jo Verbeeck, the first author of the winning paper in the Instrumentation category received his award, prize money of 1.000 euro and a metal-on-wood plaque, at the congress diner of the MC2011 EMS Extension in Kiel from Nick Schryvers, EMS Secretary while Paul Midgley, EMS President, presented the award in Materials Sciences to Zsolt Czigany at the congress diner of the MCM2011 EMS Extension in Urbino.

The Board extends its warmest congratulations to all winners and we look forward to a new round of excellent papers for the 2011 competition.

* EMS Outstanding Paper Award jury members

Chair:
Rik Brydson (Institute for Materials Research, University of Leeds, UK)

Members:
Alan Craven (Department of Physics & Astronomy, Solid State Physics, University of Glasgow, UK)
Etienne Snoeck (CEMES, CNRS, Toulouse, France)
Bob Pond (University of Exeter, UK)
Wolfgang Jäger (Mikrostrukturanalytik, Christian-Albrechts-University, Kiel, Germany)
José Carrascosa (Centro Nacional de Biotecnologia, Universidad Autonoma Madrid, Spain)
Varpu Marjomäki (Dept of Biology and Environmental Science, University of Jyväskylä, Finland)

EUROPEAN MICROSCOPY CONGRESS 2012

Manchester Central Convention Complex offers and award-winning combination of conference and exhibition facilities

Light and electron microscopy across the life and physical sciences will take centre stage in Manchester from 16th – 21st September 2012.

The 15th European Microscopy Congress is set to be Europe's largest ever event dedicated to microscopy and imaging. The centerpiece is the International Conference, the tone of which will be set by the Plenary Speakers. They include Professor Daniel Shechtman who was awarded the 2011 Nobel Prize for Chemistry for his discovery of "quasicrystals".

Dr Debbie Stokes, the emc2012 Conference Chair, said, "Amid the excitement of the Nobel Prize announcement, Professor Shechtman still found time to accept our invitation. He is going to have an exceptionally busy year, so we are delighted and honoured that he has chosen to speak at our event and highlight the importance of microscopy at the frontiers of scientific research"

Professor Shechtman is one of the seven Plenary Speakers. The full list is - Dr Christian Colliex, Professor Peter Dobson, Professor Andreas Engel, Professor Scott Fraser, Professor Jeff Lichtman, Professor Daniel Shechtman, and Professor Tony Wilson.

The quality and wide-reaching expertise of the Plenary Speakers is also reflected in the Scientific Programme. It offers something for everyone with an active interest in microscopy.

"The breadth of the programme – which embraces light and electron microscopy and spectroscopy across both the life and physical sciences, along with scanning probe and flow cytometry techniques – provides

an unparalleled opportunity for delegates," says Dr Stokes ". Not only will they be able to immerse themselves in their own area of interest, but they will also be exposed to a range of new techniques and tools that might benefit their current work, or that could feature in their careers in the future. "

The conference sessions are presented within four symposia

Physical Sciences: Applications
Functional materials; Thin films, coatings and interfaces; Art, heritage and forensics; Advanced materials; Healthcare; Nanomechanics; Towards sustainable energy and environmental protection; Earth and planetary materials; Low dimensional materials

Physical Sciences: Tools and Techniques
Advances in scanning probe microscopy: applications at the nanoscale; Advances in SEM; In situ and environmental EM; 3D/4D imaging; Advances in EM instrumentation and methods (Professor David Cockayne Memorial Symposium); Electron diffraction and crystallography; Advances in spectroscopy in STEM and CTEM; Advances in ion microscopy

Life Sciences: Applications
Organelle dynamics; Biology of the cell nucleus; Cytoskeleton and signalling; Imaging brain structure and function across different spatial and temporal scales; Uninvited guests: visualising host-pathogen interactions; Imaging and flow cytometry in cancer biology; In vivo imaging of multicellular dynamics and complexity (applications)

Life Sciences: Tools and Techniques
Super-resolution fluorescence microscopy for life sciences; Applications and advances in high content imaging; Probes for light and electron microscopy; 3D image processing (3D microscopy, 3D image analysis and developmental imaging); 3D electron microscopy of structure-function studies; Techniques for imaging brain structure and function across different spatial and temporal scales; In vivo imaging of multicellular dynamics and complexity (techniques)

The exhibition that will run alongside the conference has received great support from companies. In early February, 90 confirmed bookings had been taken for over 1500m^2 of stand-space.

As well as the conference and exhibition, emc2012 includes features such as a fully-equipped teaching and learning zone that is freely accessible to all visitors, a social programme of receptions, company parties and a congress dinner, plus an International Micrograph Competition.

You can keep up to date with all developments on emc2012 by subscribing to the e-newsletter, or by visiting www.emc2012.org

FINANCIAL REPORT OF EMS BUDGET PRESENTED AT THE GENERAL ASSEMBLY MCM2011 IN URBINO (07-09-11)

Financial report of EMS budget
presented at the General Assembly, MCM2011 in Urbino (07-09-11)

Budget 2010, final
Incomings
The majority of incomings came from the contributions of the national societies and the ECMA members. All societies and all but two companies paid their fees in the course of 2010 or at the beginning of 2011. Further incomings came from the interest rates of the savings account and from job advertising of non-EMS members. In summary, an amount of 41.361,53 € was accrued.

Expenses
Invoices for the 2011 membership fees were issued to all ECMA members and to the national societies once the updated national EMS membership data were received. So far, 34 ECMA members paid their fees and 9 companies have not yet done so. Amongst these 9 companies are the two that did not yet pay their 2010 fee and to whom reminders have been sent. From the national societies we received 10 membership fees so far and 13 are still due. On the incomings side we can expect revenues of 42.050 €.

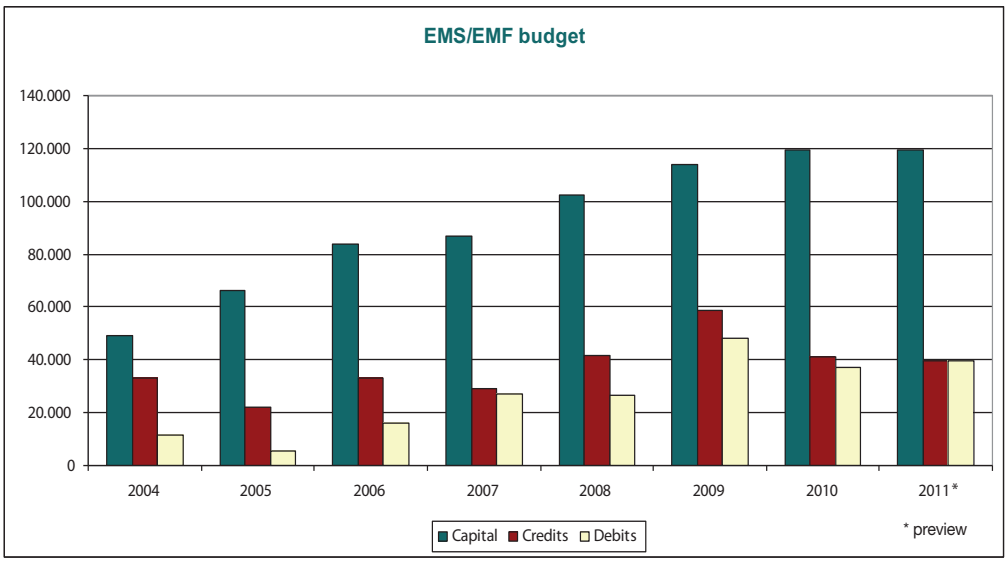
Budget 2011 (running; June 27th, 2011)
Incomings
The majority of incomings came from the contributions of the national societies and the ECMA members. All societies and all but two companies paid their fees in the course of 2010 or at the beginning of 2011. Further incomings came from the interest rates of the savings account and from job advertising of non-EMS members. In summary, an amount of 41.361,53 € was accrued.

Expenses
In 2011 there will again be 2 EMS extension meetings held (Kiel and Urbino) to be supported with 1.500 € each. EMS will support 8 sponsored meetings with 750 € each; in addition, EMS will provide 25 scholarships á 250 € for students and young scientists. This year, EMS will award for the first time three "Outstanding Paper Medals"; each with 1.000 €.
EMS board decided to reserve 5 x 1.000 € travel aid for Japanese colleagues whose microscopy equipment was affected by the massive earthquake this year (not yet claimed). Further expenses include administrative costs with the salary of a half-time secretary, two board meetings and bank costs, so that the total of expenses will amount to 47.050 €. As of June 27th, 2011, EMS had a total capital of 113.037,05 €.

Budget 2012 (proposal)
Incomings
The major revenues will again be accrued by the annual contributions of EMS members of the national societies and of ECMA members. Additionally, revenues from emc2012 can be expected based on 10 € per participant. Incomings can be expected to amount to 49.500 €.

Expenses
With these estimated incomings it will be possible to support one extension meeting with 1.500 € and 13 sponsored meetings, each 750 €. EMS can provide 35 scholarships á 250 € for students and young scientists. Further costs will cover the Outstanding Paper Medals and administrative expenses including half-time secretary, two board meetings and bank costs will amount to 49.500 €.

Christian Schöfer, m.p.
Treasurer EMS/EMF



EUROPEAN MICROSCOPY SOCIETIES

Number of EMS Members by societies (2011)

Society			*Number of Members*
Armenian Electron Microscopy Society	AEMS	Armenia	8
Austrian Society for Electron Microscopy	ASEM	Austria	120
Belgian Society for Microscopy	BSM	Belgium	310
Croatian Society for Electron Microscopy	CSEM	Croatia	75
Czechoslovak Microscopy Society	CSMS	Czech Republic	302
German Society for Electron Microscopy	DGE	Germany	311
Electron Microscopy and Analysis Group	EMAG	UK	305
Hellenic Electron Microscopy Society	HSEM	Greece	61
Hungarian Society for Microscopy	HSM	Hungary	102
Israel Society for Microscopy	ISM	Israel	98
Microscopical Society of Ireland	MSI	Ireland	77
Dutch Society for Microscopy	NVvM	The Netherlands	397
Polish Society for Microscopy	PTMi	Poland	86
Royal Microscopical Society	RMS	UK	1316
Nordic Microscopy Society	SCANDEM	Scandinavia	306
Slovene Society for Microscopy	SDM	Slovenia	77
French Microscopy Society	SFμ	France	309
Italian Society of Microscopical Sciences	SISM	Italy	316
Spanish Society for Microscopy	SME	Spain	291
Portuguese Society for Microscopy	SPMicros	Portugal	175
Serbian Society for Electron Microscopy	SSM	Serbia	92
Swiss Society for Optics and Microscopy	SSOM	Switzerland	347
Turkish Society for Microscopy	TEMD	Turkey	93
ECMA	ECMA	Corporate	48
Individual members	IND	Individual	22

European Corporate Member Assembly (ECMA)

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- GIT Verlag
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- Hitachi High-Technologies
- Horia Hulubei National Institute of Physics and Nuclear Engineering
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- Oxford Instruments GmbH
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- Technoorg Linda
- TESCAN, s.r.o
- Thermo Electron
- Thorlabs
- Tietz Video and Image Processing
- Tissue Gnostics
- VSG

EMS CALENDAR 2012

2012 Forthcoming events

- **"Quantitative Microscopy of Energy Materials" (Symposium X) session at E-MRS Spring meeting 2012: EMS sponsored event**
  May 14-18, 2012
  Strasbourg, France

- **EMBO practical course on Electron Tomography in Life Science: EMS sponsored event**
  June 18-23, 2012
  LUMC in Leiden, The Netherlands

- **15th European Microscopy Congress, emc2012**
  September 16-21, 2012
  Manchester Central Convention Complex, Manchester, UK

A complete calendar can be found at http://www.eurmicsoc.org/events.html

APPLICATION FOR MEMBERSHIP

Individual Member Subscription form

Individual membership of the European Microscopy Society is open to all microscopists for €25 per year. Note that the membership fee is €5 for members of European national microscopy societies. Please return the following form to :

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EUROPEAN CORPORATE MICROSCOPY ASSEMBLY (ECMA)

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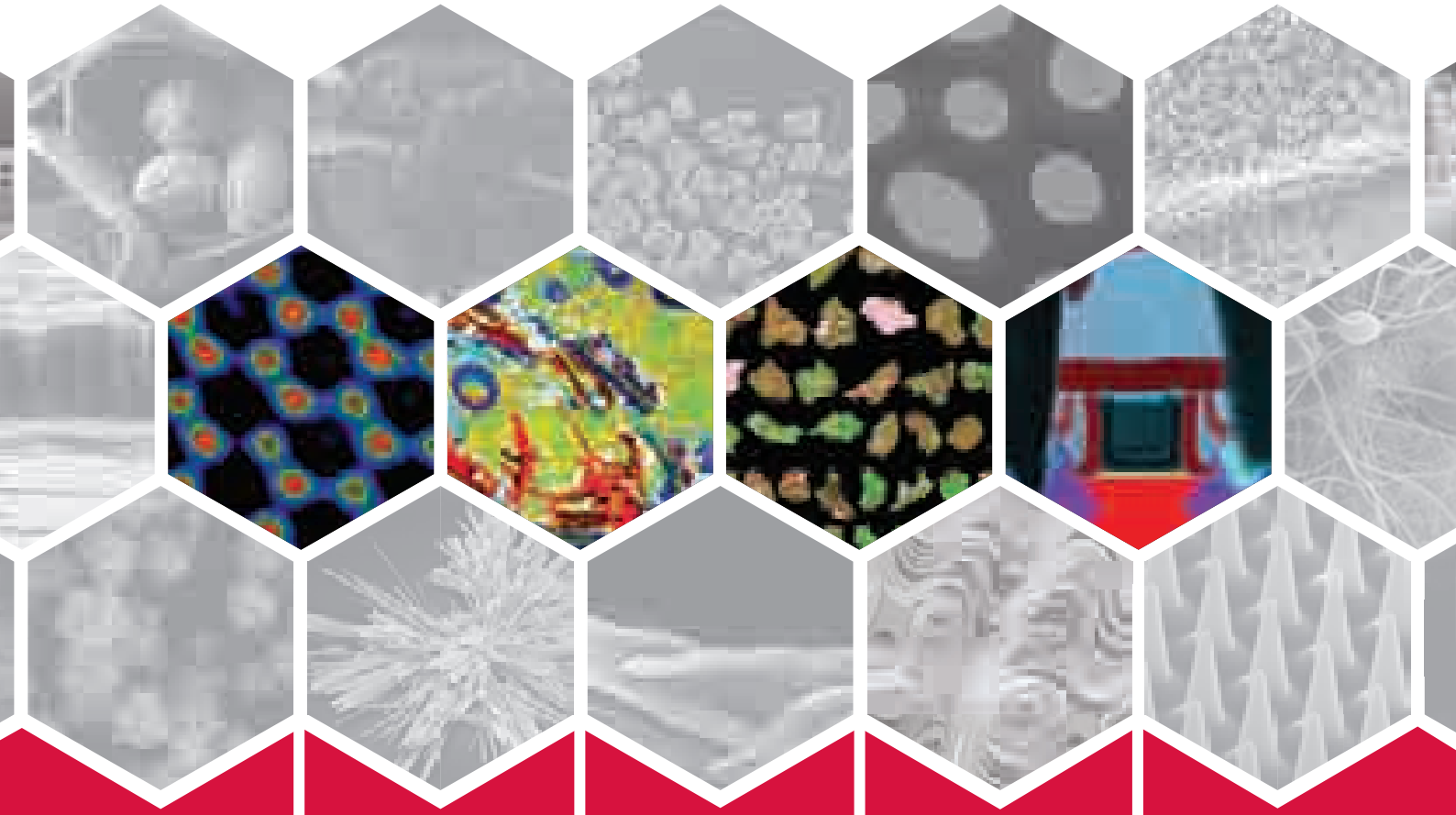

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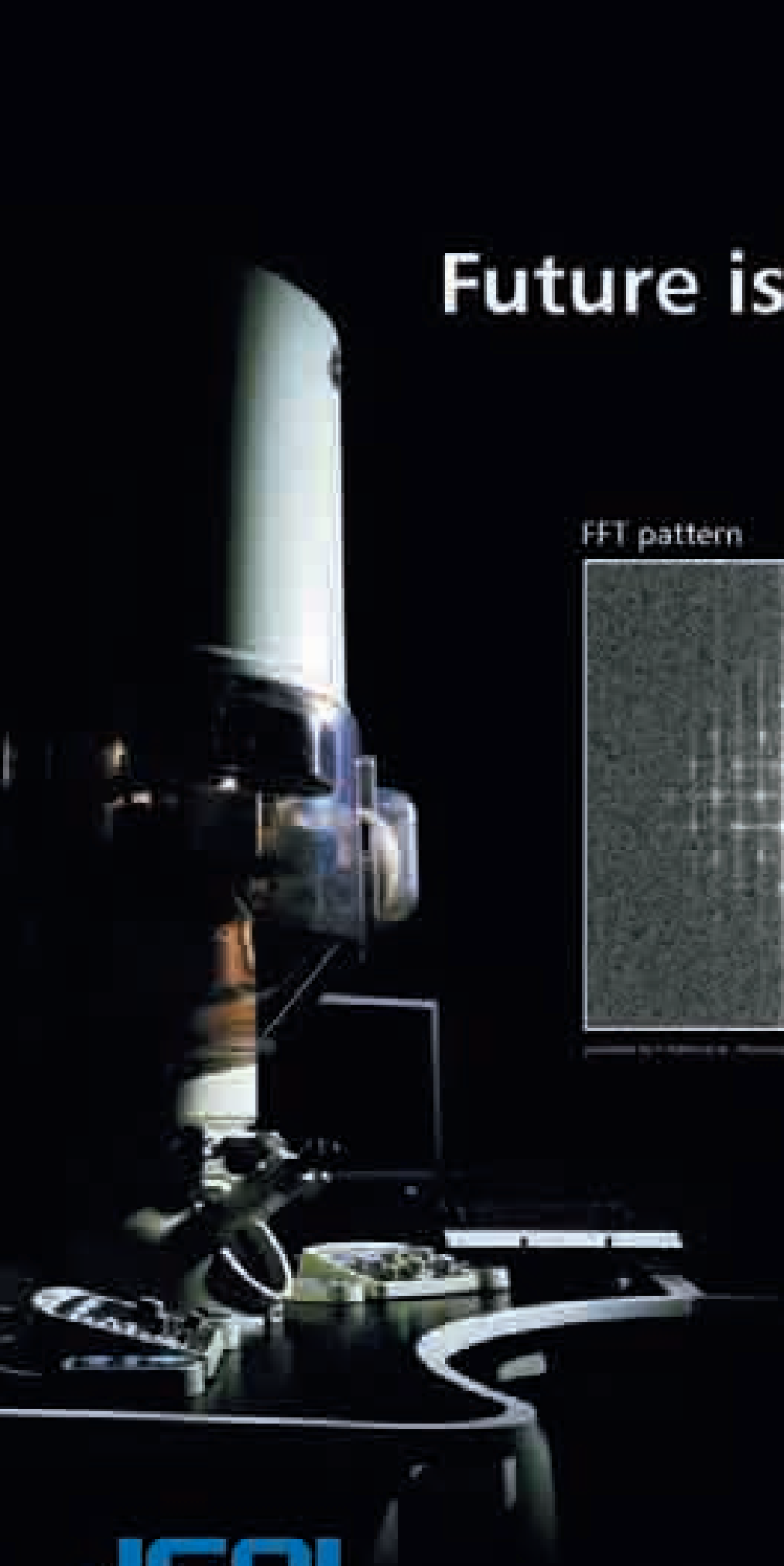

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