

MSSA NEWS

Newsletter of the Microscopy Society of Southern Africa

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Dear Microscopy Community,

The latter part of 2012 has arrived, and I'm sure that the first six months have gone by at a most alarming rate! At the new Centre for High Resolution Electron Microscopy (CHRTEM) at Nelson Mandela Metropolitan University, imaging of single atoms recently caused great excitement when viewed by means of the JEM-ARM 200F launched in October 2011. The involvement of the CHRTEM also with the SA Nanoscience and Nanotechnology Summer School soon after the launch, made the end of the year extremely busy in Port Elizabeth.

Our feature Equipment News includes some of the latest information on new equipment that has been funded by the Department of Science and Technology in partnership with the National Research Foundation of South Africa through especially the Strategic Platforms Programme. This feature will also easily link you to the NRF Equipment Database and the various specialised equipment facilities that are available for use to our post-graduate students and independent researchers.

'Focus on a Lab' again features a leading microscopy laboratory with relevant information on their history and equipment - thus highlighting various areas of expertise available within the country. We hope that this will promote greater collaboration between the microscopy-related disciplines and the use of our new equipment nationally.

Our industry partners must especially be commended for their interest also in developing microscopy in South Africa. We have included various articles on equipment and other linkages or collaborations of interest to the Microscopy Society at large. We would like to take this opportunity to invite all microscopists to join us at the **MSSA 2012** conference from 5-7 December at the University of Cape Town. This will be the **50th annual conference celebration**—and what a beautiful city to celebrate this exciting event in!

I do hope that you will enjoy all the features to this Newsletter, and I urge everyone to become involved to ensure continued success and outreach of the MSSA News.

Kindly submit all relevant news (exciting applications of microscopy in your lab, job advertisements, post doctoral opportunities etc.) and information or comments directly to me at the contact details included below.

As always, I look forward to hearing from you,

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Centre for High Resolution Transmission Electron Microscopy at NMMU produces single atom images of graphene

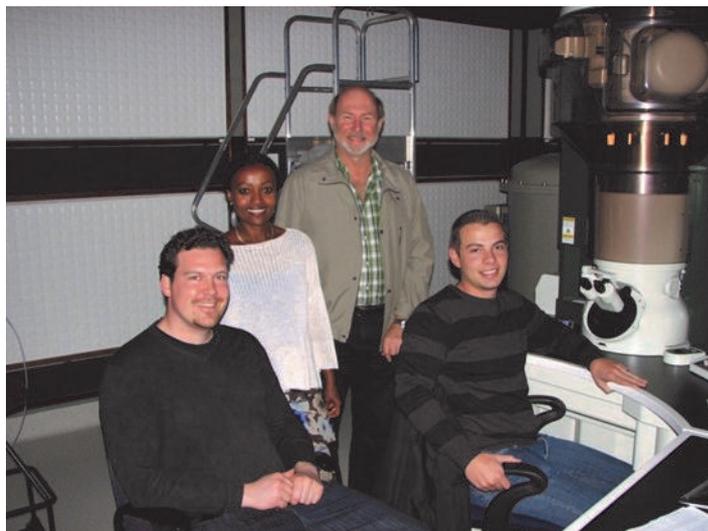
Dr Jamie Warner from the Department of Materials at Oxford University recently visited the Centre for High Resolution Transmission Electron Microscopy (HRTEM) at the Nelson Mandela Metropolitan University (NMMU). Warner, together with Prof Jan Neethling (Director of the Centre for HRTEM) and his team, successfully produced very good images of single iron atoms in graphene with the new JEOL Atomic Resolution Transmission Electron Microscope.

Dr Warner and his colleagues at Oxford University, over a period of two years, optimised the technique for the preparation of high quality graphene. Warner's decision to utilize the collaboration agreement between his department and Prof Jan Neethling at NMMU - as well as a grant from the Oppenheimer Fund - was to test the ultimate performance of the new ultra-high resolution electron microscope at NMMU with his own samples.

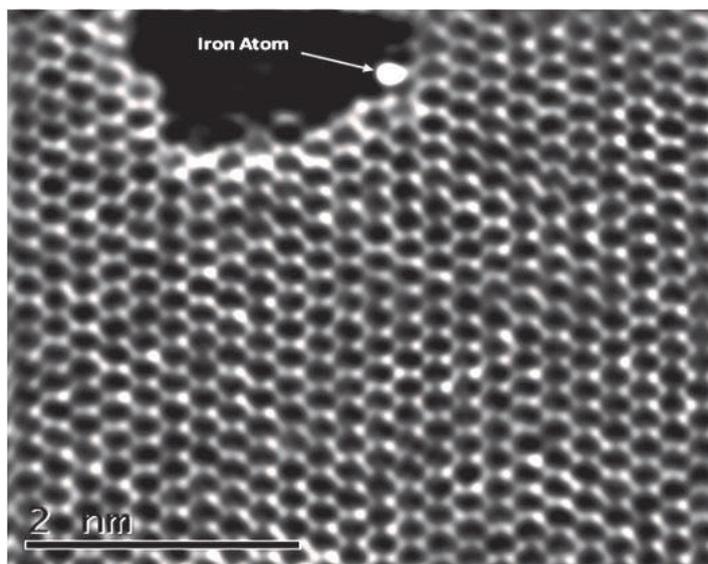
World-wide there are only a handful of research groups who are able to perform this experiment through access to similar high resolution instruments. Graphene consists of a single layer of carbon atoms packed in a honeycomb structure, and has caused great excitement among scientists since the extremely strong and thin carbon material was discovered in 2004. Due to the fact that graphene combines extraordinary properties of sheer mechanical toughness together with exceptional electrical and thermal conductivity, it has very promising applications in future high-speed electronic devices.

Utilising a special imaging mode in the HRTEM, a finely focused beam of electrons is scanned over the specimen, thus producing an image at a 100 million times magnification. The process for optimising the electron microscope takes a full day, but once this was performed, Dr Jaco Olivier from NMMU succeeded in producing especially reliable images of single iron (in this instance) atoms bonded to the carbon atoms in graphene. The nature of the single iron atoms was determined by measuring the change in kinetic energy of electrons when they collide with iron atoms in the graphene. Since the energy loss is a fingerprint of the type of atom involved in the collision, the technique is used to provide chemical information about the atoms present in the materials.

Dr Warner remarked that in order to obtain the cutting-edge results achieved on the day, four requirements must be satisfied: A superior specimen, a first-rate atomic resolution electron microscope, highly skilled electron microscope operator (Dr Jaco Olivier) together with a well-designed, vibration-free building such as the Centre for HRTEM. The success accomplished is proof that the Centre for HRTEM at NMMU has both the equipment and expertise to participate in cutting-edge research programmes in collaboration with leading international scientists.



(From left to right) Dr Jamie Warner and Ms Frewyeni Kidane (Oxford University) together with Prof Jan Neethling and Dr Jaco Olivier from the NMMU.



An ultra-high resolution electron micrograph showing the honeycomb structure of graphene with an iron atom (arrow).

Honeycomb structure of graphene with an iron atom

Dr Warner was accompanied by his spouse, Ms Frewyeni Kidane from the Development Office at Oxford University where she is concerned with the planning of fundraising activities for the University. She has generously agreed to share her wealth of international experiences and knowledge with the NMMU.

EQUIPMENT NEWS

The Department of Science and Technology in partnership with the National Research Foundation of South Africa has through the Strategic Platforms Programme made available grant funding for state-of-the-art research infrastructure and equipment to support scientific development.



**science
& technology**

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



**National
Research
Foundation**

The Strategic Platforms Programme (SPP) resides within the Human and Institutional Capacity Development (HICD) of the Research and Innovation Support and Advancement (RISA) business unit at the NRF. The SPP's vision is to enable the research infrastructure and human capacity for world class research and innovation in South Africa. Its mission is to support a knowledge economy through the acquisition, up-grade and development of state-of-the-art research equipment; incentivising quality research outputs from national facilities and facilitating access to research equipment.

In order to deliver on the NRF's key driver of producing high quality PhDs, the SPP, within the framework of the National System of Innovation focuses on the following objectives:

1. The development of enabling infrastructure including state-of-the-art research equipment and national facilities;
2. The access to research equipment and facilities through mobility and research grants;
3. Research projects in strategic areas, including Nano-technology; and
4. The development of specialised technical expertise for knowledge generation within existing and developing strategic platforms.

The Strategic Platforms Programme has provided funding for exciting new research equipment, to help researchers in their work in areas such as ancient rock art, palaeontology, material science and cardiovascular research.

National Equipment Database <http://eqdb.nrf.ac.za>

The National Equipment Database is a joint initiative between the Department of Science and Technology (DST) and the National Research Foundation (NRF) and it aims to play a critical role in:

- *Informing continued investment in research equipment and platforms;*
- *Advising researchers of what equipment is available nationally;*
- *Facilitating access to multi-user equipment; and*
- *Stimulating new applications for research infrastructure.*

The database houses all relevant information pertaining to state-of-the-art equipment acquired through DST and/or NRF funding as well as other public sector investment in specialised, multi-user research equipment. This user-friendly and searchable database is a live tool and is updated on a continuous basis by the Strategic Platforms Programme (SPP) at the NRF.

The SPP has uploaded all equipment grants awarded through the NRF Research Infrastructure Programme as well as data on state-of-the-art research equipment funded through other public sector investments.

The following are some of the exciting new equipment funded by the SPP:

1. Grant Holder: Professor Benjamin Smith, Rock Art Institute, University of the Witwatersrand

The digital imaging equipment provides field-capture and processing of high quality image data at unprecedented levels of accuracy, resolution and colour fidelity for permanent storage. It is generally used in scientific and industrial imaging, military applications and aerial photography. In this particular instance, it will be used for rock art research, Stone Age, Iron Age, hominid, heritage and fossil studies. The equipment is portable and much of its primary use will be for data capture in the field of rock paintings, stratigraphy, artefacts and skeletal remains. It will be primarily used to enhance faded and eroded rock paintings where the details are no longer visible to the naked eye as it records colour remnants at granular level. Currently, there is nothing similar in Southern Africa and it is anticipated that the majority of archaeological and paleontological departments within universities and museums will have access to the facility.



The equipment is fully operational and housed in the Heritage Imaging Laboratory at the Rock Art Institute, University of the Witwatersrand.

The Rock Art Institute currently archives over 100,000 images of African rock art which are all available at www.sarada.co.za.

Above: Hasselblad Multi-Spectral, Medium-Format, Digital Image Capture and Processing Solution for Rock-Art, Archaeology and Paleontology.

2. Grant Holder: Dr Kristian Karlson, Institute for Human Evolution, University of the Witwatersrand

A Microfocus Computed Tomography (CT) scanner is capable of scanning objects at up to 10 micron resolution, using x-rays to perform a variety of functions such as penetrating encasing materials in order to discern and visualise the internal structures of delicate fossils. Artefacts ranging in size from as small as a fossilised human tooth or as large as 0,5 m can be investigated. The study of changes in biodiversity through time, such as extinctions and origins is a core principle in the Palaeosciences and by expanding the types of data that can be quantified and compared such as internal structures and fine morphological details. The facility will substantially deepen palaeo-botanical, zoological and anthropological knowledge on key periods of the earth's past history correlated to rapid climate change and the ability of organisms to adapt or die out completely.

State-of-the-art Equipment

Other benefits would be to the study of fossilised dinosaur eggs and reconstruction of fossil remains discovered during excavations at sites such as Sterkfontein with a high degree of precision. An additional purpose of the equipment will be to investigate internal bone microstructure research in conjunction with biomedical departments. This will impact on disciplines such as forensics, human disease processes and the effects of drug treatments.

When installed in early 2012 it will not only be the only research-dedicated Microfocus CT scanner on the African continent but will also complement the NECSA CT scanning facility having some additional options. It will be housed within the Virtual Image Processing Lab at the Palaeosciences Centre thereby elevating the Institute of Human Evolution and the Bernard Price Institute to a world-class facility capable of conducting cutting-edge research in the Palaeosciences.



Left: CT scanner used to examine fossils.

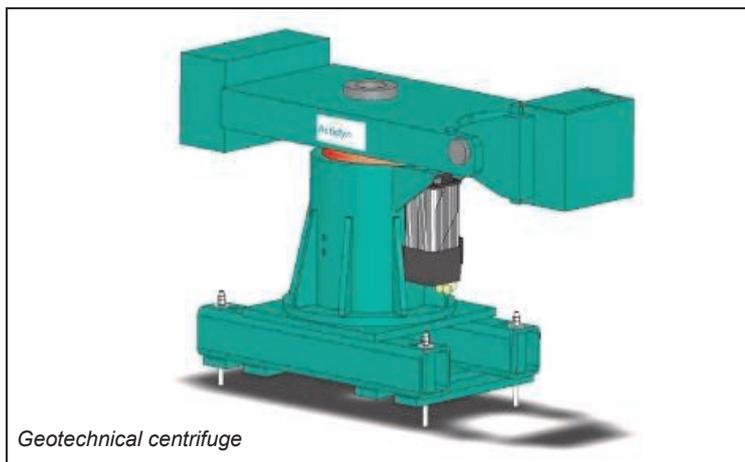
Search the Equipment Database for other equipment available nationally to be utilized in your field or discipline

<http://eqdb.nrf.ac.za>

3. Grant Holder: Professor Elsabe Kearsley, Department of Civil Engineering, University of Pretoria

The geotechnical centrifuge enables 3-dimensional numerical modelling studies to be carried out on a wide range of civil engineering, geotechnical, mining and other environmental problems where the self-weight or stress-strain behaviour of material is an important factor. It has applications in geological, geotechnical, mining, hydraulic, structural, offshore and cryogenic engineering. It also has potential in physics and the medical fields.

In centrifuge modelling, a small-scale model is placed on the centrifuge and accelerated to the required G-level. Model behaviour is then extrapolated to real world situations by means of scaling laws. The advantage of physical modelling is that the actual material can be used, negating the

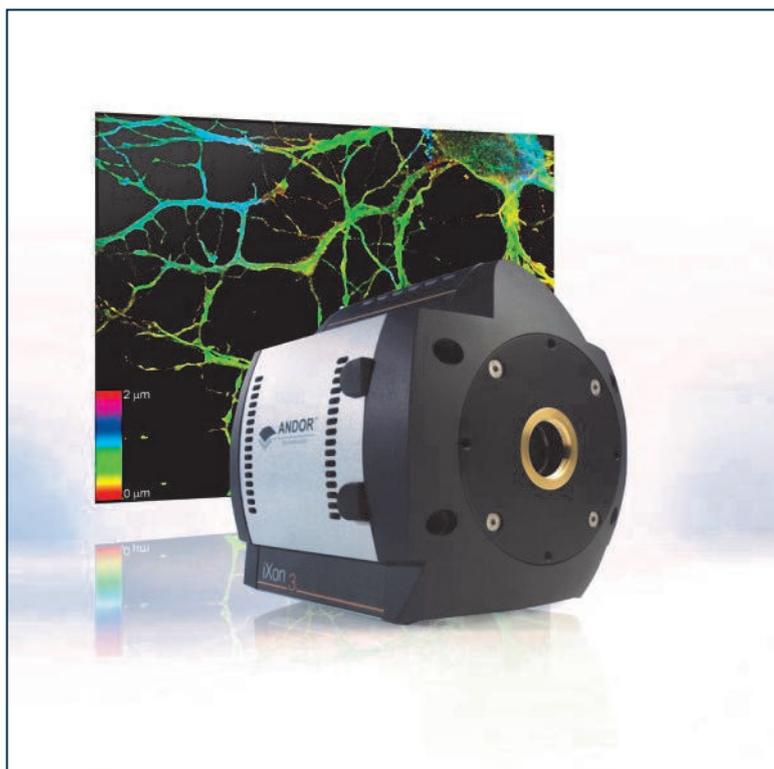


Geotechnical centrifuge

One of the contentious problems currently encountered in South Africa is that of development on dolomitic land due to the risks posed by sinkholes and subsidence. The ability to predict reactions will enhance cutting-edge solutions currently being sought by the Council for Geoscience, the CSIR and a number of engineering consultants in the fields of civil engineering, geology and mining. The Geotechnical Centrifuge will be the only one of its kind in sub-Saharan Africa and it is expected that installation and commissioning will take place in 2012, putting it on par with other installations housed at the University of Cambridge and the Massachusetts Institute of Technology.

4. Grant Holder: Dr Amanda Gulbis, SA Astronomical Observatory (SAAO)

The state-of-the-art astronomical high-speed optical camera will be used on the 1,9m, 1m and 0,7m telescopes at SAAO's Sutherland site. It will be widely used by local and international researchers in conjunction with a GPS system to trigger camera frames and the resulting data will be accurately timed to the nanosecond level with high quantum efficiency across the visible wavelength range. While the equipment is solely for astronomical use, it will be employed to obtain data across a wide range of subfields. Dr Gulbis' research interests are planetary bodies in the outer solar system, co-users study cataclysmic variable star systems, quasars, X-Ray binaries (involving black holes and neutron stars), asteroids and extra-solar planets.



South Africa's unique location and historical strength in astronomy will not only be enhanced by the acquisition but existing international SALT collaborations will be supported and increased resulting in the stimulation of new research projects. The instrument can be used to observe interesting targets outside the SALT viewing range. It is envisaged that additional complementary observations will include photometric calibrations, longer baselines on events such as eclipses and transits as well as being able to resolve activities at higher time resolution.

Nanosecond timing with high quantum efficiency across visible wavelengths

Left: High-speed optical camera to be used on SAAO telescopes at Sutherland.

5. Grantholder: Dr P Olubambi , Ultra-High Resolution Field Emission Scanning Electron Microscope (UHR FE-SEM) and a CETR UMT2 multipurpose tribocorrosion tester, Tshwane University of Technology, Pretoria Campus

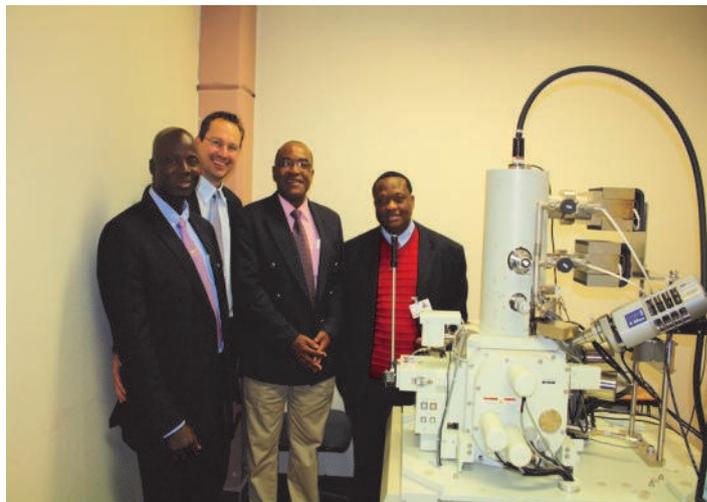
An R 8.5 million Applied Microscopy and Tribo-electrochemical Research Laboratory was officially opened at the Tshwane University of Technology (TUT), Pretoria Campus, on 8 June 2012. The laboratory was jointly funded by TUT and the National Nanotechnology Equipment Programme (NNEP) grant that was awarded to Dr Olubambi in January 2011.

Dr Olubambi's passion for advanced nanomaterials development research for the emerging technology led to the establishment of a state-of-the-art multidisciplinary nanotechnology and advanced materials characterisation research laboratory at TUT. A grant of R 6.8 million was awarded for an Ultra-High Resolution Field Emission Scanning Electron Microscope (UHR FE-SEM) and a CETR UMT2 multipurpose tribocorrosion tester. Both these instruments with very specific features are the first of their kind in Africa.

The JSM-7600F is a state-of-the-art FEG-SEM that successfully combines various analytical functions and ultra-high-resolution imaging, with exceptional features for advanced materials and nanotechnology analysis.. The SEM is fitted with Gatan heating and tensile stages for *in situ* microscopy studies and monitoring of microstructural changes, chemical composition variations, phase transformation and materials deformation behaviour under applied stress and at varying temperatures. The tribocorrosion tester allows simultaneous measurement of the tribological and electrochemical characteristics of a wide range of engineering materials. All kinds of tribological tests, including wet abrasion, dry abrasion, erosion tests, and high -temperature wear and mechanical property testing can be performed.

TUT supported the efforts made by the NRF towards Dr Olubambi's passion by providing very secure laboratory space of approximately 400m² on the ground floor of Building 3 at the Pretoria Campus, as well as additional research facilities, including two high -performance electrochemical potentiostats, an FTIR spectrometer, an atomic force microscope, and a salt spray accelerated corrosion tester.

The analytical capabilities of the new facilities were showcased during Dr Olubambi's oral and poster presentation at the launch. Key University dignitaries and collaborators from different institutions and organisations, including the DST, NRF, Advanced Laboratory Solutions (JEOL), University of Witwatersrand, the University of Pretoria, the University of Johannesburg, the University of South Africa, the North-West University, Mintek, CSIR, the Corrosion Institute of Southern Africa, and from industry, Element 6 (Pty) Ltd, Thermal Spray (Pty) Ltd and Harmony Gold were in attendance.



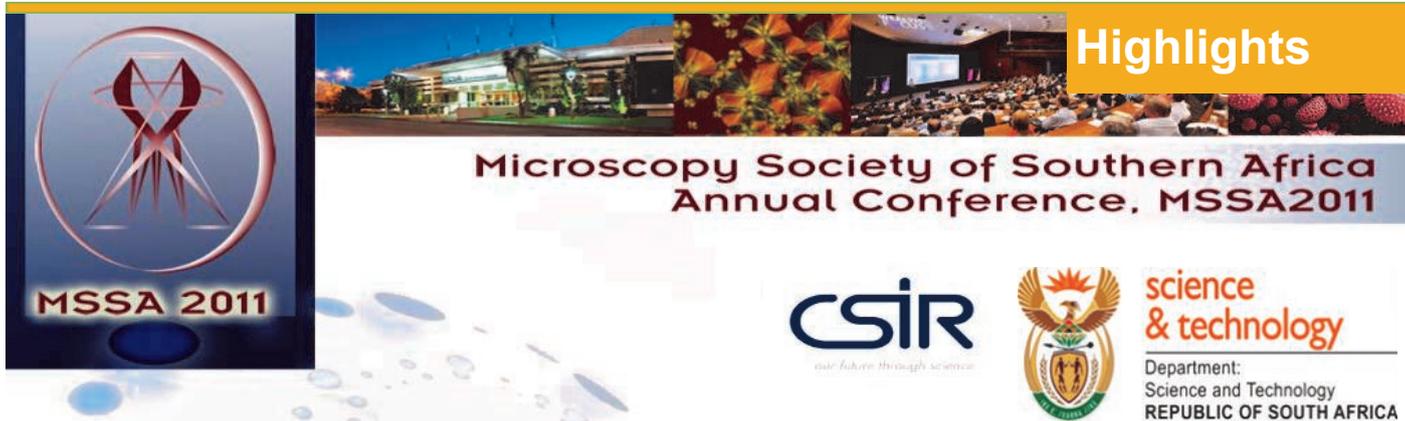
Left to right: Dr Peter Olubambi with Prof Ben van Wyk (Dean: Faculty of Engineering and the Built Environment), Dr Prins Nevhutalu (Deputy Vice-Chancellor of Research, Innovation and Partnerships), and Mr Isaac Thlabadira (Associate Dean: Faculty of Engineering and the Built Environment).

In his congratulatory address, Dr Prins Nevhutalu, Deputy Vice-Chancellor of Research, Innovation and Partnerships, mentioned that the work done by Dr Olubambi's laboratory would place TUT in the league of countries like Australia, Belgium, the USA, Canada, Algeria, Finland, Germany, France and Denmark.

State-of-the-art analytical capabilities of instruments showcased



Dr Olubambi with Ms Nontombi Marule (left) from DST and Ms Ntombi Ditlopo (right) from NRF at the launch.



MSSA 2011 was hosted by the National Centre for Nanostructural Materials (NCNSM) at the Council for Scientific and Industrial Research (CSIR) from 6-9 December, and what a great conference we had! Prof Suprakas Sinha Ray, Director of the NCNSM convened the conference whilst Ms Margaret Ward (Operations Manager NCNSM) attended to other logistics.

The conference was preceded once again by the Technical Forum (coordinated by Prof Mike Lee from NMMU). The Technical Forum covers a full day and provides delegates from MSSA as well as other external day visitors with information regarding many of the new and exciting technological advances and equipment introductions available in the market place. Dr Petra Bele from the Technical University Munich (Physics) in Germany delivered a special plenary lecture titled 'Advanced transmission electron microscopy characterization for catalyst nanoparticles using local adaptive threshold (LAT) image processing'.

With most suppliers of microscopy-related equipment and peripherals represented also in the conference exhibition, this was a perfect time to discuss new enquiries and envisioned equipment purchases as a 'one-stop' opportunity! Thank you to all our loyal exhibitors and sponsors.

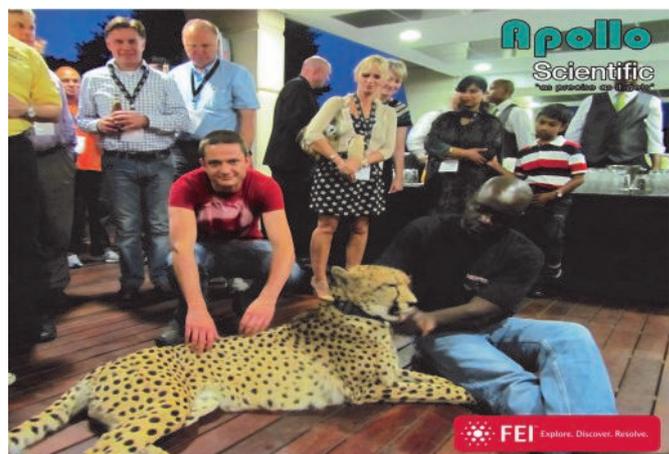
On Tuesday evening the Exhibition was officially launched at an Opening function sponsored by Apollo Scientific in partnership with FEI. This was truly memorable, with a real taste of Africa, beating drums...and the evening's African pride.....a cheetah, proudly visiting the opening with his handler! Many of our delegates took the opportunity to have the moment captured by the Apollo Scientific photographer.



Thanks to all our sponsors



Beating drums marked the beginning of festivities at the opening of the exhibition.



Dr Steve Hant from Oxford Instruments, UK enjoying a few moments with the cheetah.

On Wednesday morning, the MSSA 2011 conference was officiated by the President and CEO of the CSIR, Dr Sibusiso Sibisi whereafter Prof Suprakas Sinha Ray welcomed all delegates. Our international guest, Prof Peter Hinterdorfer (Institute for Biophysics at the Johannes Kepler University in Linz, Austria) then presented the 26th Boris Balinsky Lecture in the Life Sciences on 'Single molecular force spectroscopy and recognition imaging: applications in biology and medicine'. Dr Yoo Jin Oh from the same laboratory presented her talk encompassing 'Scanning microwave microscopy: Applications to nanostructures and biology'.

Later that evening Carl Zeiss SA hosted the 'Braai evening' at the CSIR Commons. Everyone had a wonderful time just relaxing whilst enjoying a wonderful meal with friends and acquaintances.

Thursday sessions started off with Prof Hamish Fraser from Ohio State University (Columbus, Ohio) who presented the 33rd John Matthews Memorial lecture entitled: 'Possibilities and limitations of ultra-high spatial resolution characterization in an aberration corrected (S) TEM'.

Members at the AGM unanimously elected Dr James Wesley-Smith to continue as President of MSSA for 2012, congratulations!

Presentations lasted late into Friday afternoon, and later in the evening the Gala dinner and Awards function was held at the CSIR Conference Centre. The banquet event was sponsored by Advanced Laboratory Solutions (ALS) – we had a wonderful evening with congratulatory certificates and prizes for the award winners, and an exciting show that kept everyone spellbound!

Thank you to all the sponsors of our annual awards, and to Supermagic that provided the entertainment which most definitely gave us a super evening of illusions! A magical evening indeed thanks to ALS, and a wonderful end to another fantastic meeting of microscopists!



Prof Suprakas Sinha Ray (NCNSM, CSIR) welcoming guests at the Gala Dinner.



Margaret Ward (NCNSM, CSIR) and Rob Claassen (FEI).



Our entertainers from Supermagic during the show — no animals were harmed.



Prof Jan Neethling with Dr Petra Bele (Technical University Munich, Germany) (back) and the team from the CHRTEM at NMMU.



Prof Jan Neethling (NMMU), Dr Chantelle Baker (UL) and Dave Perrett (ALS).



Chris Botha (ALS) together with (left to right) Grant Martin, Sone Ungerer and Muller du Plessis from Carl Zeiss SA.

Award Winners: MSSA 2011

ALS/JEOL AWARD for the Most Upcoming Microscopist. The winner of this award (amounting to an estimated R25,000) is sponsored to travel abroad and present a paper / poster at an international Conference.....

C. Mshumi (UCT)

ANASPEC/ CARL ZEISS PRIZE of R1,000 for the paper or poster that uses microscopy to address an industry-related problem.....

E. Venter (UP)

FEI PRIZE for each of the best papers published in a recognised international Journal for Physical Sciences or Life Sciences during the period July 2010 to June 2011.....

None awarded in 2011

FIONA GRAHAM PRIZE of R1,500 is awarded to students who submit a 'first-time-accepted-no-changes-required' abstract for the conference.....

O.T. Ashiru (UKZN)

MARY VEENSTRA PRIZE of R500 is awarded for the best poster presentation on any form of microscopy presented at the conference.....

N. Govender (UKZN)

SMM TECHNOLOGIES AWARD of R1,000 for the best paper or poster using confocal microscopy.

S.M. Bekker (UP)

SMM TECHNOLOGIES prize of R1,000 for the most innovative technique in microscopy, and/or on the novel use in SA of an established technique.....

G.F. Ndlovu (CSIR, UFS)

WIRSAM LIGHT MICROSCOPY PRIZE of an Olympus camera for the best light microscopy oral or poster presentation.....

J. Bandyopadhyay (CSIR)

WIRSAM SCIENTIFIC awards a prize of R850 for the best paper presented by a student author.....

S.V. van Breda (UP)

WIRSAM TESCAN PRIZE for R1,000 for the most exceptional presentation at the conference

G.F. Ndlovu (CSIR, UFS)

CARL ZEISS prize for the best low voltage scanning electron micrograph.....

J.H. O'Connell & A. Janse van Vuuren (NMMU) (shared)

ALS & JEOL AWARD

Ms Chiuwa Mshumi from the University of Cape Town, has scooped the most coveted award at MSSA 2011!

She has been awarded the **ALS/JEOL AWARD FOR THE MOST UPCOMING MICROSCOPIST** which has generously been sponsored by Advanced Laboratory Solutions to the value of approximately R25 000.

The prize entitles Ms. Mshumi to visit the European Microscopy Conference (EMC2012) in Manchester. Chumani has been accepted to do an oral presentation of her paper entitled: **The L13 Ordered Structure In Copper 75 At.% Platinum** by C. Mshumi, R. Vanfleet and C.I. Lang.



From left to right: Dr Larry Stoter (Jeol, UK), Ms Chiuwa Mshumi, Prof Candy Lang (UCT), and Mr Alessandro Beccaro (ALS, Financial Director)



Well done Chiuwa!

SA Nanoscience and Nanotechnology Summer School 2011

The Centre for HRTEM at NMMU was requested to host the SA Nanoscience and Nanotechnology Summer School in partnership with the Department of Science and Technology (DST) from 27 November to 2 December 2011.

In a foreword to the Summer school, Dr Phil Mjwara (Director-General: Science and Technology, DST) mentioned that this programme is intended to equip our young scientists with the fundamentals of Nanoscience and Nanotechnology in order to prepare them for future nanotechnology research. The Programme has further been designed to advance some objectives of the National Nanotechnology Strategy in order to develop human capital as well as an enabling environment that will support the long-term understanding of the design, synthesis, characterization, modeling and fabrication of nanomaterials. The Summer school also complements a suite of other Programmes that South Africa has put in place for the development of nanotechnology nationally.

Further to this, Mr Matlho Molapisi (Director: Emerging Research Areas, DST) reflected similar sentiments that in order to understand nanoscience and conduct meaningful, cutting-edge research, the Summer school particularly focused on understanding characterization techniques. The Centre for HRTEM, as one of the country's world class facilities, would be able to assist with practical aspects of the School programme that covers fundamentals and principles of nanotechnology across many disciplines in the SA nanotechnology landscape focusing amongst others on water purification and health such as nanomedicine and targeted deliveries.



Dr Phil Mjwara (Director-General: Science and Technology, DST)



Mr Matlho Molapisi (Director: Emerging Research Areas, DST)

Summer school focused on understanding characterization techniques



Participants at the Summer School held from 27 Nov to 2 Dec 2011.

The following Centre for HRTEM staff and collaborators associated with the Centre presented lectures: Dr T Heiligers, Prof M Lee, Prof J Neethling, Prof A Kirkland (Oxford) and Prof P van Aken (Max Planck Institute). Others involved from NMMU were Prof JR Botha, Prof C McClelland and Dr N Hashe; and from other institutions, Prof L Petrik (UWC), Prof T Sewell (UCT), Prof R Krause (UJ), Prof H Courtois (France) and Dr M Wiedenbeck (Germany).

Mr Phil Mjwara expressed the gratitude of the DST to all lecturers involved with the Nanoscience Summer School, particularly the international contributors. It is through these Programmes, that South Africa has become a global contributor to nanoscience and nanotechnologies research as evidenced by outputs we continue to generate by our research.

Tech INFO

Moving towards LED lighting

Most of our MSSA members will be very familiar with a standard light microscope, or as some call it, an optical microscope. Ninety nine percent of microscopes use optics, so by definition all microscopes are optical devices and what distinguishes one from the other, is the source or technique used to create the image. Hence I've learned to call them light microscopes, but I have digressed.....

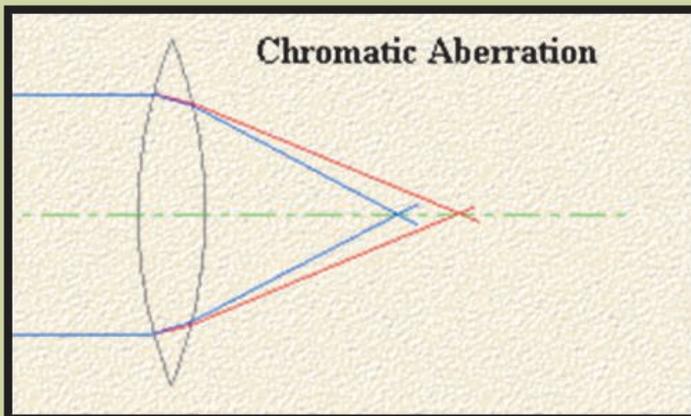
We are so encouraged, by Eskom in particular, to move to the energy saving lifestyle which also includes the fact that today you can buy a LED bulb that uses 4 watts of power to replace a conventional bulb that uses 100watts.

So can we use this same power saving in our microscopes?

The answer is simple: Yes and no.

To understand this clear answer you need to understand the physics of a light source. So, here we go, it's fairly easy.

When light passes through a glass lens the path of the light is "bent" as it enters the glass and again as it exits the glass to the air again. The amount that it deviates is determined by the type and shape of the glass, but in this article, we are focusing on the wavelength. The colour of light is determined by its wavelength. Blue light focuses closest to the lens than red light. This is called *chromatic aberration*.



Did you know that this is why the sky appears blue and the sunsets are red? During the day the light from the sun diffracts in the atmosphere and the blue light focuses quickest. At sunset and sunrise, there is more atmosphere for the light to travel through due to the sun being so low to the horizon and so the blue light has focused a long way away and the red light still travels to where you are sitting enjoying the sundowners.

When designing a microscope we want all the colours to focus on the same spot and so the light source needs to have a specific colour temperature or spread of colours. So, if we are sun loving South Africans, we have grown up seeing the world in natural sun light which has a colour temperature of 5200K.

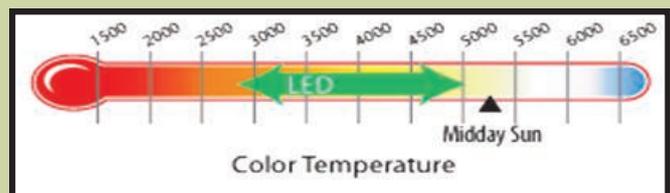
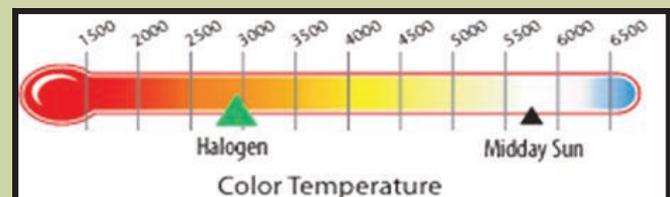
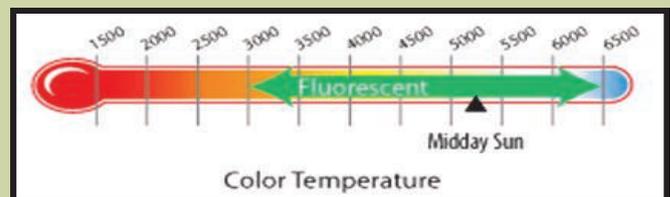
A fluorescent bulb, for example, has a colour temperature that ranges from 3000k to 6500k. With that wide a spread, it would be difficult to get a good image.

Normal tungsten wired bulbs are cheap and well tested and has a colour temperature of 2800K.

But another interesting factor comes in here. The lower the colour temperature the "warmer" the light becomes. High colour temperature makes the light source bluer. The blue colour is a shorter wavelength. I could blow you away with some maths now, but basically the shorter the wavelength the better the resolution of the microscope. So, if we add some halogen gas to the standard bulb, the colour temperature goes up to almost 3000K and is much brighter too.

So can we use LEDs? By the way LED is short for light emitting diode. It's an electronic device that emits light when a current is passed through it. Over the years we had just red green and yellow LED's, but now we get a range of colours that are available. Basically we can get colour temperatures ranging from 2500K to 5000K from LED bulbs.

However, the main drawback is that the LED bulb creates a spread of colour temperature. The daylight bulbs have a spread of 5000K to 6000K and the warm light is 2700k to 3300K. So, for some applications, such as in tuberculosis research, the LED lighting source is ideal as it illuminates sufficiently to identify the samples and does not need a lot of power to drive the microscopes using LEDs. But soon, I am sure LED will be far more common.



Focus on a Lab



science
& technology

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

The Characterisation Facility of the National Centre for Nanostructured Materials – CSIR

The National Centre for Nanostructured Materials (NCNSM) was created by the DST in 2007 to support and advance nanotechnology research conducted within the CSIR as well as externally. The Characterisation Facility (CF) provides the platform to conduct that research. Equipment housed ranges from optical spectrophotometers (Nanolog and UV-Vis, Raman microscope, FT-IR, PL), Small Angle and Wide Angle X-ray scattering, XRD, AFM / STM, a JEOL 2100 HRTEM (LaB₆) and cold-FEG 7500 SEM, and a CARL ZEISS Auriga FIB-SEM. Additionally, there is a host of equipment equally critical to polymer research, such as DSCs, TGA, DMA, polarising microscope and a LEICA cryomicrotome. The two main research focus areas at the Centre are the development of nanocomposites and sensors, although staff collaborate with other scientists in academia and industry on a wide range of topics.

Since its creation, the CF has grown dramatically in the volume and complexity of work handled and, in response to this growing demand, four new staff will be appointed during 2012. The NCNSM is headed by Prof. Suprakas Sinha Ray, with Margaret Ward as Centre Operations Manager. Dr James Wesley-Smith heads the CF, and is ably assisted by instrument operators Charity Maepa, Thomas Malwela (our resident FIB wizard), and soon to be joined by Sharon Eggers and

The CF will soon be re-deploying an electronic booking system, which will streamline access to any of our instruments. (Details will be announced via the MSSA listserv.)

While operators are provided to assist with the analysis, users deemed proficient in the use of the equipment will be able to work independently. In this regard, the NCNSM and the Facility plan to step up its role to develop capacity in SA by joining hands with the DST/NRF, MSSA, other Universities and the Trade and hold courses in microscopy and analysis at regular intervals. The Centre's infrastructure is ideally suited for this, and in-house expertise will be boosted by local and international invited speakers from various fields.

Enquiries should be directed to:
Prof. Suprakas Sinha Ray (rsuprakas@csir.co.za),
Margaret Ward (Mward@csir.co.za) or
Dr J. Wesley-Smith (jwesleysmith@csir.co.za).

On behalf of the NCNSM and the CSIR, I wish to thank Dr Chantelle Baker and MSSA for giving us the opportunity to share details from the Centre in this Newsletter, and look forward to an exciting 50th Anniversary MSSA in Cape Town!

James Wesley-Smith

Priscilla retires

Priscilla Maartens retires after 24 years at the University of KwaZulu-Natal!



We will miss you at MSSA Priscilla!

Most members of MSSA have known Priscilla from the Electron Microscope Unit at the Westville campus, where she has assisted numerous staff and students with electron microscopy over the years.

Wishing Priscilla well at the Gala and Awards Ceremony of MSSA 2011, is Mr Dave Perrett on the left (Marketing Director, Advanced Laboratory Solutions) and Dr James Wesley-Smith (President, MSSA 2012) who has worked with Priscilla for many years.

From all at MSSA, we wish Priscilla a wonderful retirement and hope that in the years to come she will still visit the annual conferences to meet with old friends and reminisce with fond memories.

MSSA TRUST

These awards are only open to persons holding South African citizenship or permanent residence

MSSA Trust Bursary

The value of the student bursary for one year will be **R15,000** by competition.

The project involved must contain a **significant** microscopy component.

Please note: Due to SARS regulations, regrettably the Trust is no longer in a position to fund travel to, and accommodation at, conferences and workshops.

General funding

The **Microscopy Society of Southern Africa (MSSA) Trust** wishes to promote microscopy in Southern Africa and improve the microscopy skills of its people. As such, applications for funding in the following areas are invited:

- 1) promoting microscopy and science careers in southern Africa,
- 2) towards the organization of microscopy based workshops or schools in Southern Africa,
- 3) promoting microscopy to learners in schools,
- 4) attendance at microscopy conferences or workshops*.

Application forms and details are obtainable from the Secretary of the Trust, Alan Hall. These must be submitted by e-mail only to alan.hall@up.ac.za Telephone: (012) 420 2075

Applications must contain all information considered relevant including:

- 1) *letter of support from the head of department or supervisor,*
- 2) *CV of the person or persons involved,*
- 3) *details of the conference, workshop, event or project planned,*
- 4) *specific benefits to be obtained by the person (s),*
- 5) *must commit to giving lecture(s) / seminar(s) hold a workshop, write article(s) on return,*
- 6) *detailed budget,*
- 7) *details of applications made or to be made to other funding sources and their response etc.*

DEADLINE for all applications is Wednesday 24 October 2012

Depending on the size of the application, it is normally expected that the Trust will only partially fund the total budget. Hopefully all applicants will be notified by December 2012 of the decision of the Trust. Successful applicants will be required to provide proof of attendance at the funded event or audited accounts when organising events etc., write a detailed article on their attendance or event for the MSSA Newsletter. A presentation on what was learned/ gained is required at the scientific sessions or Technical Forum of the next MSSA conference.

Prof Mike Witcomb

Chairperson, MSSA Trust

14 June 2012

MSSA TRUST BURSARY awarded 2011

R15 000 awarded to Mr Deran Reddy, a PhD student at the School of Anatomical Sciences, Medical School, University of the Witwatersrand. Deran's research involves a morphological and morphometric investigation into morphogenesis of the crocodilian lung.



MSSA TRUST AWARDS General Funding 2011

R9,000 to **Mr Andani Mulelu**, MSc student at Medical Biochemistry, University of Cape Town for sample preparation consumables (R1,000) and microscope time (R8,000).

R13,500 to **Ms Shelley Milstein**, Co-ordinator of the Pfukani, Giyani, Limpopo Province Node for the Wessa Eco-School project. The original request to the Trust was to put basic optical microscopes in rural schools in the Mopani district, and for funds to travel to the schools. We envisaged some problems with this such as security and maintenance of all the microscopes. After subsequent discussions with Alan Hall, Shelley purchased two microscopes, a stereo and a transmission optical microscope plus a digital camera. This then will allow images to be shown on a screen so enabling many more students to view different types of samples at the same time. The two microscopes will be taken around the various schools.

R18,000 to **Dr Lucky Lebelo**, a Senior Lecturer in the Department of Life and Consumer Sciences, School of Agricultural and Life Sciences at the University of South Africa (UNISA, Florida Campus). The funding is towards their outreach program, started in 2011, involving a disadvantaged school, Diepsloot Combined School, which is situated in a township north of Johannesburg. The township is characterized by poverty, lack of basic services such as water, sanitation and electricity. While there is electricity supplied to the school area, most households are not electrified. The UNISA staff members are assisting and empowering the educators with some of the teaching activities and, in particular, the most challenging, the practical component of both the life-and physical science subjects. The funding is towards optical microscopes and associated materials.

Honorary MSSA Members

Prof Trevor Sewell (University of Cape Town) (*left*) and Prof Michael Witcomb (University of Witwatersrand, Emeritus Professor) (*right*) here seen with Dr James Wesley-Smith (President, MSSA) (*middle*) after receiving their Honorary Life Membership from the Society at the Award ceremony of the MSSA 2011 conference.

Congratulations!



Apollo Scientific Achieves “Best Business Growth in 2011” Award

For the majority of businesses across the globe, 2011 will stand out as a challenging and tedious year. For Apollo Scientific however, it was in many ways one of the most prosperous years ever! And the proof is in the pudding:

Apollo recently travelled to the Netherlands for FEI's Annual Sales conference where Craig Blignaut (Managing Director) and Rakesh Patel (FEI Product Manager) represented Apollo Scientific at FEI's yearly Awards Ceremony. At this prestigious Ceremony, Apollo Scientific walked away with the Award for “Best Business Growth for 2011”. Apollo's Sales bookings increased with an unprecedented 88% which placed us first in terms of sales growth WORLD WIDE.

Apollo Scientific wishes to extend our utmost gratitude to our loyal customers for their on-going support as well as to Rakesh Patel who has managed to help Apollo soar to new heights with the FEI agency.



Award for Business Growth 2011

For any FEI queries, please contact Rakesh Patel at rakesh@apollosci.co.za.

Collaboration between Carl Zeiss Microscopy and Gatan Announced



***In situ* ultramicrotome turns ZEISS FE-SEM into high speed 3D cell and tissue imaging system**

We make it visible.

OBERKOCHEM/Germany,31.05.2012.

The collaboration between Carl Zeiss Microscopy and Gatan, Inc. was officially announced. Carl Zeiss Microscopy is a leading supplier of light and electron microscopes. Gatan, Inc. is the world's leading manufacturer of instrumentation and software for the enhancement of electron microscopes' operation and performance. In this joint project, the companies will promote the development and sales of a system which provides high-resolution 3D data of resin embedded cell and tissue samples. Member of the Board and General Manager BioSciences Division of Carl Zeiss Microscopy Dr. Bernhard Ohnesorge is very pleased about the collaboration: "The 3View versions of our FE-SEMs MERLIN and SIGMA VP support the general application trend in biomedical research of 3D imaging and reconstruction to understand context in tissues. Since the knowhow of Gatan and Carl Zeiss complement each other ideally these systems are the easiest to use and fastest tools for a biologist to follow this trend into electron microscopy resolution and dramatically increase work efficiency." The 3View system consists of an ultramicrotome directly integrated into the vacuum chamber of the ZEISS MERLIN and SIGMA VP field emission scanning electron microscopes. It enables the automated serial block face imaging of embedded samples (e.g. cells or tissue) with slice thickness down to 15 nanometers..

Thus, image stacks containing hundreds, or even thousands of sequential slices may be generated, and a 3D profile of the sample with nanometer resolution built up. Joel Mancuso, Applications Manager at Gatan, Inc. recognizes the benefits: "The 3View system simplifies three-dimensional electron microscopy providing researchers with limited electron microscopy expertise an opportunity to collect high resolution volumetric datasets by removing the difficult step of cutting and collecting ultrathin sections." The first pilot customers are already using the systems successfully, among them Renovo Neural Inc. (Cleveland), offering 3D EM commercial services.



3View Integrated into MERLIN and SIGMA VP for fast and convenient 3D Imaging for tissue samples in the FE-SEM.

MICROSCOPY SOCIETY OF SOUTHERN AFRICA

On behalf of the
Microscopy Society of Southern Africa and the
Conference Organisers,
we take pleasure in inviting you to attend the
50th Annual Conference of MSSA
which is hosted by the Electron Microscope Unit
of the University of Cape Town

We sincerely hope you will be able to attend.

Conference Dates

Pre-conference workshop: 2-3 December

Technical Forum: 4 December

MSSA 2012 Conference: 5-7 December

Important Deadlines

Abstract submission (proceedings): 31st August

Cover micrograph competition: 31st August

Abstract submission (Tech Forum): 31st October

Final registration/payment: 1st October

Student Grant Applications: 30 September

FEI Prize reprint submissions: 30 September

MSSA 2012

For information please visit
our website at



<http://www.mssa2012.co.za>

Conference Convenors:

Prof. Trevor Sewell

RW James Building, Upper Campus, UCT

Email: Trevor.Sewell@uct.ac.za

Mrs. Miranda Waldron

Electron Microscope Unit, UCT

Email: miranda.waldron@uct.ac.za

Conference Secretariat:

Amanda Dominy

Salamander Conferences

PO Box 140

Century City 7446

Cape Town, South Africa

Tel: +27 (21) 447 2098 Fax: +27 (86) 513 1799

Email: info@mssa2012.co.za

Versa 3D DualBeam™ Building on the history and success of FEI's pioneering DualBeam

Versa 3D's highly configurable platform allows customers to adapt the system's capabilities to their specific requirements. The high vacuum- only version is ideal for routine conductive or coated samples. An alternative version, combining high and low vacuum modes, gives the flexibility to work with a range of samples including uncoated, non-conductive samples. Optional ESEM mode allows electron beam imaging of uncoated, non-conductive or naturally hydrated samples and supports in situ analysis and dynamic experimentation.

In high vacuum mode, the high current Focused Ion Beam (FIB) enables fast material removal and low voltage clean-up or low-damage surface finishing. Gas chemistries are available for depositing materials or further enhancing the FIB milling rate or selectivity. Nonconductive samples are easily milled with the automated Drift Suppression milling mode which is also supported in the optional AutoSlice and View™ G3 software; for collecting serial slice electron images in both high and low vacuum after high vacuum FIB slicing. Automation can be extended to gather EDS or EBSD data from successive slices. With advanced automation, Versa 3D can acquire images at high vacuum, low voltage and use high or low vacuum for higher voltage imaging and analysis, optimizing conditions for each detector to enhance 3D data segmentation for quantitative 3D reconstruction.

The ultra-large chamber allows addition of a variety of accessories and detectors to support a broad range of imaging and analytical techniques, accessing information from every angle. The new widescreen display provides additional imaging area to view results. New software (SmartSCAN™ and DCFI™) and electronics offer even greater imaging stability for increased performance in all operating modes. Developments in field emission electron source technology ensure clear, sharp electron images as well as increased electron beam current for enhanced EDS, WDS and EBSD analysis.

With Versa 3D the choice is yours to optimize the system for conductive samples in high vacuum; non-conductive samples with low vacuum; or expand the horizons of research to dynamic applications.



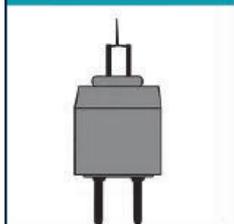
Key Benefits

- DualBeam functionality to examine surface and sub-surface areas of any sample (sample modification at the nm and μm scale)
- Combination of high current FIB cutting/deposition and low voltage FIB cleaning to quickly cut/deposit materials and produce the highest quality, low damage sample surfaces
- High quality TEM and atom probe sample preparation with low voltage cleaning for atomic level study by TEM/ atom probe
- Full complement of software* to perform advanced tasks like 3D volume slicing for characterization, sample preparation and prototyping from CAD or image files
- Flexibility of electron beam vacuum configuration for examining conductive samples in high vacuum only or conductive and non-conductive samples in high and low vacuum configured system
- Auto Slice and View G3* enables 3D characterization of a wide range of materials types with a suite of detectors* to obtain information from every angle ESEM* option enables dynamic experiments involving gas* and thermal control*

*Optional Extras



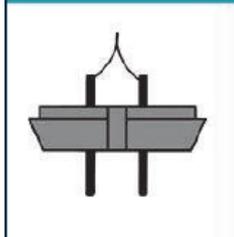
Re-Tip your JEOL Filaments



Original JEOL k-type filaments, are pre-centred and therefore offer superior performance. Re-tipped JEOL k-type filaments, acquired from Agar Scientific, require minimal user centring and are a more cost-effective alternative in certain applications.



Should you require your filaments re-tipped, please contact Goneseelen Chetty telephonically on his direct office line 0100018713 or via email on GoneseelenC@advancedlab.co.za to arrange for collection of your old filaments.



Upcoming Events

2012

July 29-August 2

Microscopy & Microanalysis 2012

Phoenix, AZ USA

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

September 16-21

European Microscopy Congress Emc 2012

Manchester, UK

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

December 5-7

Microscopy Society of Southern Africa MSSA 2012

UCT, Cape Town

<http://www.mssa2012.co.za>

2013

August 4-8

Microscopy & Microanalysis 2013

Indianapolis, IN USA

2014

September 7-12

International Microscopy Congress IMC 2014

Prague, Czech Republic

<http://www.imc2014.com/>



JOIN THE MICROSCOPY SOCIETY OF SOUTHERN AFRICA

The Society is open to professional scientists, technicians and technologists, as well as students and members of the trade [microscopy and associated equipment].

Information and application forms are available from <http://www.microscopy.org.za/membership.htm>

Membership entitles you to:

A reduced fee for conference registration
 Receipt of the MSSA Newsletter during the year
 Access to discussion groups (MSSA List server) and regional meetings

Your status with the society can be confirmed, or

checked, by contacting Alan Hall,

E-mail: alan.hall@up.ac.za

Membership Fee*:

Ordinary membership..... R 70.00 p.a.

Student membership..... R 35.00

Institutional membership..... R280.00

* An entry fee of R30.00 is payable by new Ordinary and Institutional members.

Carl Zeiss Launch FIB-SEM with Laser Ablation Capabilities



We make it visible.

Carl Zeiss has launched the AURIGA Laser, a new advanced system combining the specific advantages of the AURIGA CrossBeam (FIB-SEM) workstation with the capabilities of a pulsed micro-focus laser for fast ablation of material.



AURIGA Laser is particularly useful for the examination of samples where the target structure is deeply buried under material layers. To gain access to the target structure this material needs to be removed - a procedure which is difficult to conduct with conventional techniques. Mechanical ablation and cross-sectioning of large material volumes often cause deformations, making the sample unsuitable for further examination. In contrast, applying a focused ion beam is inefficient, because the process is much too slow. The new AURIGA Laser combines proven FIB-SEM operation with new material ablation capabilities based on the application of a nanosecond pulsed, diode-pumped solid-state laser. Ablation with a pulsed micro-focus laser beam offers clear advantages: it does not damage the sample, and it enables ablation rates comparable to mechanical removal.

The scanning laser used in this unique solution is a nanosecond pulsed, diode-pumped solid-state laser operating at 355 nm provided by TRUMPF AG (Ditzingen, Germany). It was chosen from a broad range of different types of lasers to optimally meet the demands of preparing structures for SEM examination. In cooperation with Carl Zeiss, researchers from the Fraunhofer-Institute for Non-destructive Testing (IZFP - Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren) in Dresden, have optimized the workflow of the innovative tool - ease of use, fast transfer procedures and fast relocation of the region of interest on the sample under examination, took center stage in the cooperation.

AURIGA Laser FIB-SEM

In order to protect the AURIGA FIB-SEM workstation and detectors from debris generated during the laser ablation process, the system is equipped with a separate chamber for laser operation. After preparing the structure of interest with the laser the sample is transferred under vacuum conditions to the main chamber for SEM examination or FIB polishing. Retrieving the target structure is achieved automatically. The transfer is carried out quickly and smoothly in a matter of seconds - resulting in a very simple and continuous workflow. To realize specific ablation patterns, the laser is equipped with CAD software controlling the scanner head. This enables the user to pre-define even highly complex patterns of the sample structure.

AURIGA Laser is the first such instrument on the market. Dr. Martin Kienle, Director CrossBeam product line at Carl Zeiss, is convinced: "AURIGA Laser is a milestone in simplifying the SEM examination of a vast range of innovative materials and structures, overcoming the limitations of conventional preparation methods. It enables the users to carry out new applications and to examine complex structures like next-generation nano-technology processors or flexible thin film solar cells." Future applications comprise semiconductor manufacturing, photovoltaics, polymer electronics, joining and contacting technologies, oil and gas prospection, geomechanical consulting, pharmaceuticals, life sciences and materials research in general. The system is also suitable for the preparation of microsystems that contain soft or brittle phases, such as foams, lightweight construction materials, glass fibers or ceramics, composite materials, pore filters, batteries, fuel cells or geological samples.

Carl Zeiss Launch FIB-SEM with Laser Ablation Capabilities
 Saved from URL: <http://www.azonano.com/news.aspx?newsID=24435>