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BIENNIAL CONFERENCE
5 – 8 DECEMBER 2022
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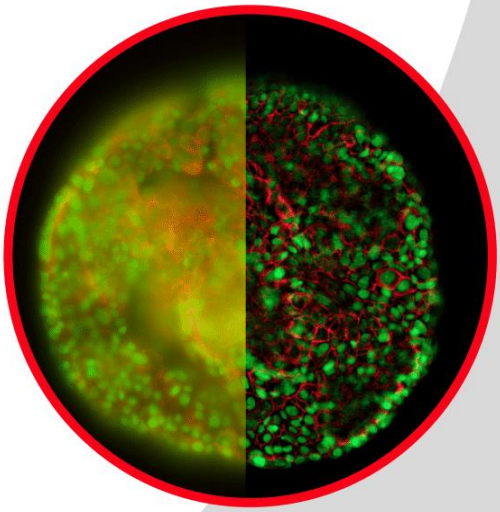

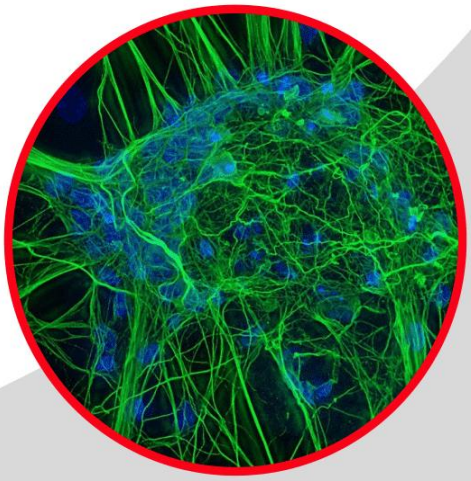

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Dr James Wesley-Smith
Life Sciences Editor

WELCOMING MESSAGE FROM THE MSSA PRESIDENT

Dear delegates

It is my great pleasure, on behalf of the Executive Committee of MSSA, to welcome you to the 57th biennial conference of the Microscopy Society of Southern Africa. This year the conference is held at **Gold Reef City Theme Park Hotel, Johannesburg** and is convened by Prof Rodney Genga from the University of the Witwatersrand. Rodney and the local organising team have been working hard to organise another memorable event. The theme for this conference is "***Microscopy is Fun***". It is my sincerest hope that we embody this theme at MSSA 2022 and rediscover our passion and joy in microscopy again, rekindle old friendships and share valuable scientific knowledge amongst each other. This, especially, after the negative impacts of the global COVID-19 pandemic.

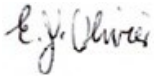
We especially extend a warm welcome to our distinguished invited speakers who have travelled from many different institutions locally and abroad to join us for this conference. The 34th Boris Balinsky Lecture will be presented by Prof Mark Ellisman from the National Center for Microscopy and Imaging Research (NCMIR), UCSD. Dr Iwona Jóźwik from the National Centre for Nuclear Research, NOMATEN Centre of Excellence MAB+ Division, Świerk-Otwock, Poland will present the 41st John Matthews Memorial Lecture. Keynote lectures will be presented by Prof Carolina Pohl-Albertyn from University of the Free State, Prof Nanette Oberholzer from the University of Pretoria, and Dr Able Swanepoel from North-West University for the Life Sciences stream. For the Materials Science stream keynote lectures will be presented from Dr Jacques O'Connell from Nelson Mandela University, Dr Pinkie Ntola from Durban University of Technology, Prof Alexander Ziegler from the University of the Witwatersrand, and Prof Angus Kirkland from the University of Oxford. A keynote lecture by Dr Alisa Govender from SASOL South Africa (Pty) Ltd will also be presented as part of our Technical Forum.

A special welcome is extended to the commercial sector and other sponsors. Specifically, we would like to thank our Diamond, Platinum and Gold Sponsors Angstrom Scientific, Zeiss South Africa and Wirsam Scientific for their generous support of MSSA 2022. It is the valued support of our sponsors and exhibitor that make the MSSA conference affordable for our academics and students. The awarding of prizes for top presentations and publications are also made possible through these kind sponsorships. I urge everyone to visit and support the trade exhibitions and presentations at the Technical Forum.

The 2022 MSSA proceedings are the product of dedicated and hard work by the editors Jan Neethling and James Wesley-Smith (with the assistance of Chantelle Venter) and Arno Janse van Vuuren who was responsible for the compilation of the abstracts and proceedings. A word of thanks to Mike Lee for compiling the Technical Forum programme. The contribution by the reviewers of the abstracts and the delegates who submitted abstracts for presentation at the conference is gratefully acknowledged as the Society continuously seeks to maintain a high standard in the proceedings through a stringent review process.

As always, MSSA gratefully acknowledges the Department of Science and Innovation and the National Research Foundation for their continued financial investment in microscopy infrastructure and conferences. Many South African universities now have world-class instruments which are used to produce high-quality research and publications and train postgraduate students. Finally, I would like to thank all delegates, local and international, for contributing to the success of this conference.

We trust that you will leave MSSA 2022 with happy memories of a rewarding scientific and social experience.



Sincerely,

Dr Jaco Olivier
President MSSA

INVITED PLENARY SPEAKERS

34TH BORIS BALINSKY MEMORIAL LECTURE

Dr. Mark H. Ellisman is the director of the National Center for Microscopy and Imaging Research (NCMIR), and since 1996, Dr. Ellisman has served as the founding director of the UCSD Center for Research in Biological Systems (CRBS) Dr. Ellisman established NCMIR in 1988 to achieve greater understanding of the structure and function of the nervous system by developing 3D light and electron microscopy methods. As a founding fellow of the American Institute of Medical and Biological Engineering, Dr. Ellisman has received numerous awards including the Jacob Javits Neuroscience Investigator Award from the National Institutes of Health (NIH) and the Creativity Award from the National Science Foundation (NSF).

My research has included development and application of advanced imaging technologies to obtain new information about cell structure and function, structural correlates of nerve impulse conduction and axonal transport. As well as better understanding the cellular interactions that occur during nervous system regeneration, the cellular mechanisms that regulate transient changes in cytoplasmic calcium, which modulate neuronal functioning and aging processes in the central nervous system.

I was always curious about biology but grew up with an aeronautical engineer, who taught me how to make things, generously transferring knowledge and a fundamental understanding of the properties of materials and physics. Through these early experiences, I realized that the small accomplishments of making something gave great satisfaction, and this engendered in me a passion for engineering, and making tools to look deeper into the functioning of biological systems.

As an Undergraduate in Berkeley in the 60's, I was inspired by the ground-breaking work of Watson and Crick to work on big problems in biology. I went to college wondering how the brain worked. What is the essence of perception? Can we accurately describe and understand the molecular chemistry of a moment of existence? While at Berkeley, I finished my course requirements early which gave me the opportunity to do some additional experiments, looking at basic brain physiology. That opportunity led me to study the nervous system. If you look at any specific neuron, what makes the functional characteristics of that neuron unique? What confers on neurons their unique biophysical and functional characteristics?

The brain has been my passion for my entire life. It is important to appreciate that most important questions about our feelings and emotions require understanding mechanisms that span many different scales – from the atomic scale molecular properties of the proteins that regulate the sensitivity of specific neurons, that are connected through microscopic functional circuits that encompass our entire brains. These changes and effects can occur in seconds but can have consequences for our perception of stress and anxiety that can last a lifetime in some cases. The fascination of these bigger problems has enabled me to fulfil my passion for engineering by creating both novel solutions for complex multiscale problems. As important though is my passion to make my work easily understandable to anyone - to help educate, and understand the exquisite beauty of the brain, its' amazing and wonderful flexibility, and to open people's minds to be curious regarding how our brains really work

41ST JOHN MATTHEWS MEMORIAL LECTURE

Iwona Jóźwik is a physicist holding a PhD from the Faculty of Applied Physics and Mathematics of the Gdańsk University of Technology, Gdańsk, Poland (2006). She is a specialist in scanning electron microscopy (SEM) and sample preparation using focused ion beam (FIB) techniques.

Since 2008 she is employed at the Lukasiewicz Research Network – Institute of Microelectronics and Photonics in Warsaw, Poland (former Institute of Electronic Materials Technology). In 2017 she has joined the National Center for Nuclear Research, Świerk-Otwock, Poland, where she leads the Research Group "Materials Characterization" of NOMATEN Centre of Excellence. Her interests include the application of low-energy scanning electron microscopy to direct visualization of damage in ion-irradiated materials. She has published more than 69 scientific and her h-index is 14 (Scopus) with more than 680 citations.

LIFE SCIENCE KEYNOTE SPEAKERS

CAROLINA POHL-ALBERTYN
SARChI Research Chair in Pathogenic Yeasts
Professor: Microbiology and Biochemistry
Faculty: Natural and Agricultural Science
University of the Free State

NANETTE OBERHOLZER
Associate Professor: Anatomy
Faculty of Health Sciences
University of Pretoria

ALBE SWANEPOEL
Postdoctoral Researcher
Health Sciences
North-West University

MATERIALS SCIENCE KEYNOTE SPEAKERS

JACQUES O'CONNELL
Senior Microscope Scientist
Centre for HRTEM
Physics Department
Nelson Mandela University

PINKIE NTOLA
Lecturer
Department of Chemistry
Durban University of Technology

ALEXANDER ZIEGLER
Director
Microscopy and Microanalysis Unit
University of the Witwatersrand
Johannesburg

TECHNICAL FORUM KEYNOTE SPEAKER

ALISA GOVENDER
Senior Scientist, Materials
Group Technology, a division of Sasol South Africa (Pty) Ltd

PLENARY SESSION SPEAKER

ANGUS KIRKLAND
Science Director
Electron Physical Science Imaging Centre
Diamond Lightsource Ltd.
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CONFERENCE CONVENER

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SOCIAL EVENTS

For planning purposes please note the following social functions:

Monday 5 December- Welcome Cocktail Event
Venue: Oppenheimer Exhibition Hall
Time: 17h30
Dress: Smart Casual

Tuesday 6 December – Braai Evening
Venue: Gold Reef City Old Mining Town street
Time: 19h00
Dress Code: Smart Casual

Wednesday 7 December - Student evening/ Dinner at Leisure
Venue: Gold Reef City Old Mining Town street
Time: 19h00
Dress Code: Casual

Thursday 8 December - Gala Dinner and Awards Ceremony
Venue: Oppenheimer Exhibition Hall
Time: 19h00 for 19h30
Dress Code: Formal/Traditional

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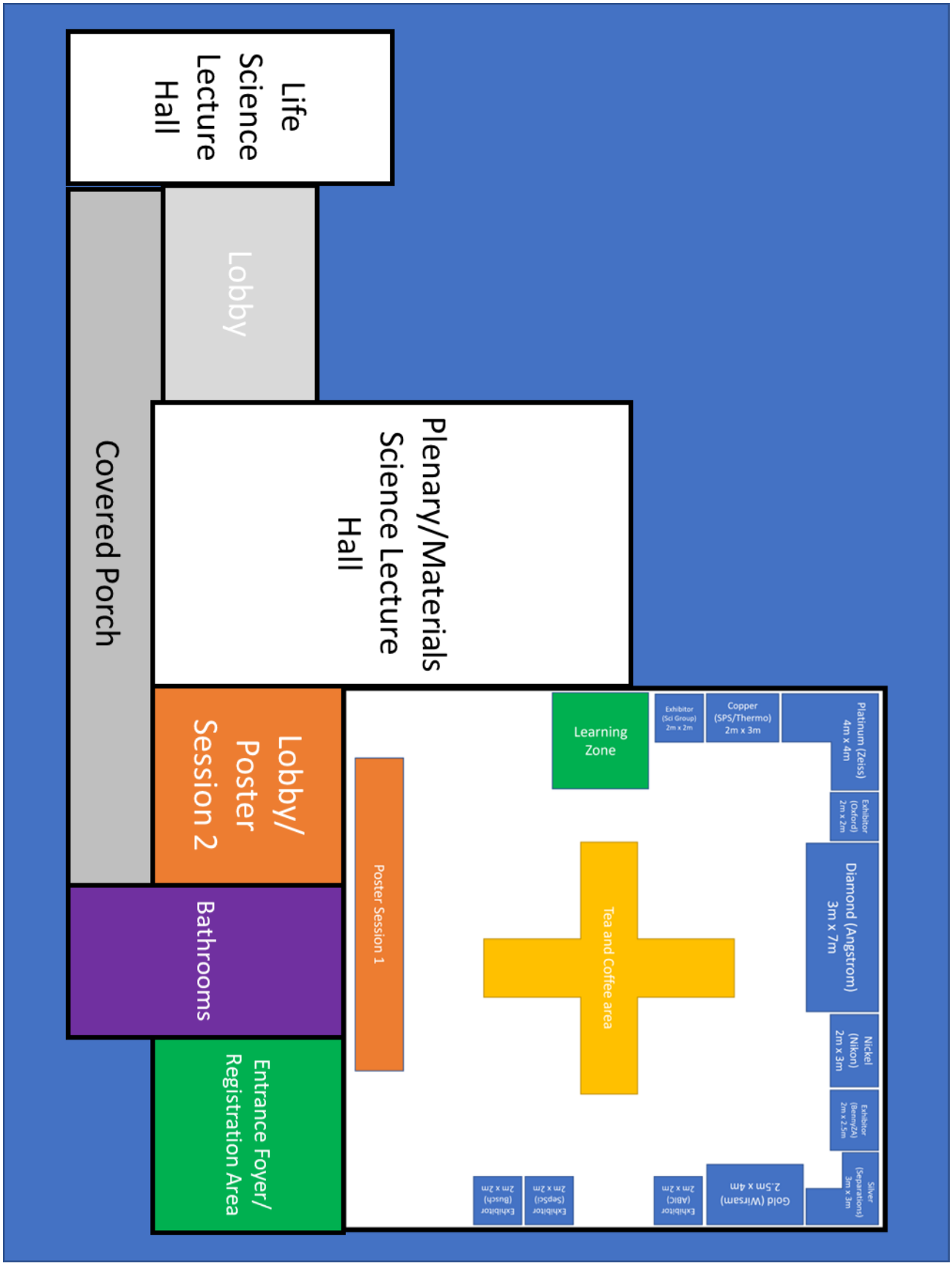

CONFERENCE PROGRAMME

TECHNICAL FORUM

MONDAY 5 DECEMBER Venue: Plenary/MS Hall (Oppenheimer Conference Room 2)		
07.30 - 08.30	REGISTRATION Oppenheimer Entrance Foyer Technical Forum Sponsored by	
08.30 - 08.40	**WELCOME AND OPENING REMARKS**	
SESSION 1	**PLENARY** **Chair: Jaco Olivier**	
08.40 - 09.10	Alisa Govender	Applications of electron microscopy: Case studies from Sasol's cobalt catalyst development history
SESSION 2	**TRAINING AND PUBLISHING** **Chair: James Wesley-Smith**	
09.10 - 09.30	Luc Harmsen	How to train field staff on the potential of environmental conditions affecting microscope results
09.30 – 09.50	Martina Crole	Teach 'n eat. A method to engage veterinary science students with histology
09:50 – 10.10	Mike Lee	EDS: The good, the bad, the ugly and what not to report.
10:10 -10:40	**TEA**	
SESSION 3	**INSTRUMENTATION** **Chair: Mike Lee**	
10:40 - 11.00	Andy Yarwood	Which TEM is best for your application? (online)
11:00 – 11:20	Paul Spellward	Direct detection cameras for all TEM applications
11:20 – 11:40	Daniel Phifer	Phase identification accuracy improvements for SEM-EDS based mineralogical characterization
11:40 – 12:00	Eudri Venter	Choosing the correct SEM for your imaging requirements
12:00 – 12:20	Paul Spellward	Next generation hardware and powerful software for Energy Filtered TEM and EELS Spectroscopy
12.20 – 13.20	**LUNCH – Barney's Restaurant**	

	MONDAY 5 DECEMBER – AFTERNOON	
SESSION 5	**FIB, EBSD AND X-RAY IMAGING** **Chair: Johan Westraadt**	
13.20 - 13.40	Keith Dicks	Correlative Indexing with Dynamic Template Matching – Hybrid EBSD indexing beyond Library or Spherical Indexing
13.40 – 14.00	Paul Spellward	Advances in EBSD acquisition and analysis with new systems from EDAX
14:00 - 14.20	Hugo Fernandes	New advances in micro-computed tomography using spectral CT scanning
14.20 - 14.40	Mohsen Samadi Khoshkhoo	High spatial resolution X-ray microscopy - a new technology approach for the research laboratory
14:40 – 15:00	Daniel Phifer	Advanced Gallium-free (S)TEM sample preparation with multiple ion species FIB
15:00 – 15:20	**TEA**	
SESSION 6	**GENERAL** **Chair: Jacques O'Connell**	
15.20 – 15:40	Coenraad Snyman	Bell 430 helicopter accident investigation: the role of advanced microscopy and microanalysis
15:40 – 16:00	Mike Reiche	The African BioImaging Consortium: a microscopy community for biomedical researchers in Africa
16:00 – 16:20	Holisha Moodley	Introducing the Mica Microhub Imaging System from Leica Microsystems
16:20 – 16:40	Deniz Ugurlar	Thermo Fisher Scientific Cryo-EM workflows; Developed for the masses
16:40 – 17:00	Ben Barkay	Delong America Company Profile
17:00 – 17:05	**CLOSING REMARKS**	
17.30 - 21.00	**WELCOME COCKTAIL EVENT** **Venue: Oppenheimer Exhibition Hall (Conference Room 1)**	**Sponsored by** SEPARATIONS Simply Spectacular

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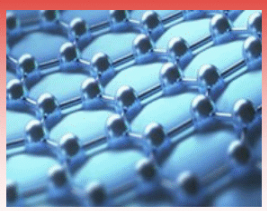

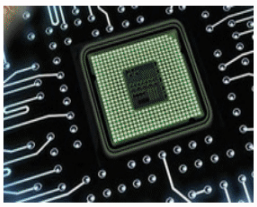

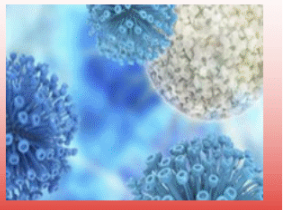

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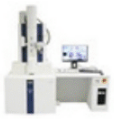

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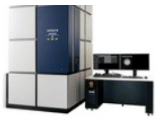

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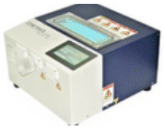

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TECHNICAL FORUM ABSTRACTS

Applications of electron microscopy: Case studies from Sasol's cobalt catalyst development history

A.Govender, D.J. Moodley, J.H. Potgieter and T.Botha

Energy Operations, R&T, Sasol, South Africa

Corresponding Author E-mail: alisa.govender@sasol.com

Although Fischer−Tropsch synthesis (FTS) was discovered almost one hundred years ago, it remains a fascinating topic, having relevance from an industrial perspective. It is one of Sasol's core process technologies and involves the conversion of synthesis gas over a catalyst into valuable products. In recent times, the possibility of using renewable feedstock such as green hydrogen, biomass and unavoidable CO2 to produce sustainable fuels and chemicals, has sparked renewed interest in the process. Sasol's earliest FTS technology was on iron-based catalysts but by the late 1980's, development efforts were shifted toward cobalt-based catalysts which could be utilized for the low temperature Fischer-Tropsch reaction (LTFT).[1] This directional change was based on the high selectivity to linear paraffins, low water gas shift activity and long catalyst lifetime that could be obtained with supported cobalt catalysts. The aspects that were investigated through the development history focused on attaining and improving the catalyst's physical and physico-chemical properties which in turn would yield desired stability, activity and selectivity during the Co-LTFT process. With these properties being central to the performance of the catalyst during the reaction, electron microscopy has formed an integral part in the catalyst's development. The technique has played a role in studying and optimizing catalyst/support design, catalyst activation, behaviour during the FTS as well as regeneration of spent catalysts. The case studies that will be presented cover examples from one or more of these categories and will explain how nanoscale information is dynamically applied to design, understand and improve industrially relevant catalyst systems.

How to train field staff on the potential of environmental conditions affecting microscope results.

L. Harmsen

Carl ZEISS Microscopy. Oberkochen Germany

Corresponding Author E-mail: luc.harmsen@zeiss.com

All microscopes are designed to magnify information in a sample down to possibly nano meter resolution. To allow us to capture these images, the sample must be kept perfectly still. Any movement of the sample is also magnified by the same optics, creating images that may not meet the users' expectations. In addition to this basic requirement, as we develop more workflow processes in the microscopes, the current requirement for keeping the sample steady is pushing limits on what we can achieve over longer time periods. We are therefore looking at room and site conditions not just to take that one award winning micrograph but rather how to ensure the customer/owner of the system realises they are the key factor in keeping the site as best suited to their users' image quality needs. We look at methods to explain the typical factors like room temperature, acoustic sound pressure, seismic vibrations, and AC and near DC magnetic field. With the constraints of available suitable sites, funds for damping systems and conditions outside of the users' control, we focus on managing the customers' expectations versus the best theoretical operating conditions by training the field support staff in educating the user on these topics in a easy to understand way.

Teach ‘n eat. A method to engage veterinary science students with histology

M.R. Crole

Department of Anatomy and Physiology, Faculty of

Veterinary Science, University of Pretoria, Onderstepoort, South Africa, 0110.

Corresponding Author E-mail: martina.crole@up.ac.za

Veterinary students need to learn important species differences. The kidneys display species specific morphology. For histology, dissection of the porcine, bovine and lamb kidney and cooking of the organ, together with an outdoor vegetable potjie, was used as a social setting background to an activity of drawing a schematic of the histological structure of the kidney (the nephron). The teach ‘n eat followed on a brief introductory lecture of the histology of the kidney. To learn the latter, students had access to virtual microscopy, worksheets, flashcards and recorded lectures. Students brought a cutting board, clean knives and a bowl to ensure hygienic preparation and transport of the kidneys for cooking. They worked in groups and studied the kidney before final preparation. Outside, the groups used chalk to draw the nephron on the paving. This occurred while the kidneys were being cooked by the students. The best nephron drawing was voted for by the class and the winning group received a prize. Feedback indicated that they found it a valuable and enjoyable learning experience which they recommended should be continued in future. The concept was not offensive to students, and it provided motivation for the students to attend class. There was appreciation for delivering content in a stress-free manner. The chalk drawings were a fun and interactive learning activity. The ‘teach ’n eat’ concept has proved to be a rewarding and enjoyable event. It promoted and applied anatomical and histological learning, introduced students to dissecting fresh material.

EDS: The good, the bad, the ugly and what not to report.

M. Lee and W. Goosen

Centre for HRTEM, Nelson Mandela University, Gqeberha, South Africa.

Corresponding Author E-mail: michael.lee@mandela.ac.za

Energy dispersive X-ray spectroscopy (EDS), in association with SEM and TEM, is a routine technique used for the characterization of materials to determine the elemental composition and/or elemental distribution via spatial mapping. EDS is a quantitative technique which implies that the results should be presented in terms of the techniques prescribed by chemical metrology and the standards adopted by ISO/TC202 for microbeam analysis. Firstly, in this review we will illustrate selected examples of EDS data presentations extracted from several peer reviewed publications. These examples will be used to demonstrate the failure of authors to abide by correct scientific protocols for the processing and presentation of EDS data. In many cases EDS mapping is presented as a space filling exercise in a publication and lacking in scientific merit. Secondly, examples of the correct format for quantitative EDS data, which satisfies the criteria prescribed by chemical metrology procedures and ISO 202 standards, will be presented.

Which TEM is best for your application?

A. Yarwood

JEOL (UK) Ltd, Silvercourt,

Watchmead, Welwyn Garden City, Herts, AL7 1LT, England

Ångstrom, 370 Angus Crescent, Northlands Business Park, 29 Newmarket Road, Northriding,

Randburg 2169

Corresponding Author E-mail: andy.yarwood@jeoluk.com

Transmission electron microscopes are an essential tool for research, inspection and/or diagnostic studies in multiple disciplines. However, it can be a very daunting task to select the correct TEM for the intended scientific investigation. As the cost of TEMs is considerable, it is important to understand the differences between the various TEM technologies and how these differences will influence the results that an operator will be able to obtain from the TEM. For example, the choice of Accelerating voltage is often easy to answer with common applications such as biological tissue sections (120kV TEM) or materials lattice imaging (200kV TEM). The accelerating voltage required for other techniques is not always clear. A good example is that 200kV is often used for biological applications on modern TEMs. However, the question of which source to choose, Tungsten, LaB_6 or Field emission, can be difficult. It is important to understand the effect of the source on the application, and any benefits of the choice of emitter on attachments such as STEM or EDS. With respect to imaging, the choice of digital camera is often complicated. JEOL has several fully embedded options to make this part of the decision process easier. This presentation will show some state-of-the-art TEMs with application images to exemplify the optimum instrument choice for you applications.

Direct detection cameras for all TEM applications

P. Spellward

Gatan Inc.

Corresponding Author E-mai:l paul.spellward@ametek.com

Gatan is expanding the uses of direct detection cameras into all areas of materials science. Building on the success of the K3 system camera, which remains the ultimate performance system for 200-300kV, Gatan has three new direct detectors. The new METRO camera is a game changing system which brings the sensitivity, speed and dose efficiency of counting direct detection to all materials science applications. Priced similarly to a top end scintillator-based camera, the METRO will become the standard for 200kV materials science. Alongside, the ALPINE camera is bringing structural biology to 120-200kV TEMs not previously thought suitable for such work. Laboratories no longer need a dedicated and costly cryo-TEM to participate in this technique. Gatan also offers the STELA camera, which is a hybrid pixel system optimised for STEM diffraction work but also ideal for low voltage EELS. This talk will explain the new systems and the new applications possibilities.

Phase identification accuracy improvements for SEM-EDS based mineralogical characterization

E. Goergen and D. Phifer

Thermo Fisher Scientific

Corresponding Author E-mail: daniel.phifer@thermofisher.com

Automated Mineralogy as a dedicated technology for Mineral Phase identification using Scanning Electron Microscopy & Energy Dispersive X-ray microanalysis (SEM-EDS) platforms has existed for decades. Complicated mineral compositions, grain boundaries and fine-grained mineral textures have complicated use of automated mineralogy across all rock/ore deposit types. A new technology has emerged that aims to solve these issues and provide a new, modern platform for the accurate characterization of rock and mineral compositions. The technique draws upon unique computational methods and provides accurate results with little to no a priori knowledge of the sample required. The technology also allows for new insights into intra crystalline chemical variation due to the automatic handling of solid solution mineral phases. This communication will provide a background on the technology and some examples of where this new approach can improve our understanding of the rock formation and evolution and it's place as a critical addition to traditional petrologic techniques. Several significant improvements to automated classification have been developed including the patented “mixel” concept. With the patented mixel concept: the interaction volume of the SEM electron beam-where the x-ray compositional signals are generated-often sit on grain boundaries or on fine-grained/ complicated mineral textures[1]. This creates situations where multiple minerals are contributing to the x-ray signal being generated. These mixtures complicate interpretation and create manual effort to confirm accurate analysis. Rafiei & Kennedy, illustrate the value of accurate fine grained mineral characterization in their study of mudrock evolution. They utilized Maps mineralogy to identify trends and differences from chemical weathering reactions[2] not easily observed or quantified via other techniques. Such combinations of mineral accuracy with spatial context, even on complicated samples, opens new observations to isolate and report trends obscured by limitations of optical approaches or difficult to interpret compositional/mineralogical textures. Overall, Maps Minerology is an excellent platform to bring automated minerology to the next level. As features are added and capabilities expand, the ease of use and completeness of this solution are expected to meet demands for complex analysis even more.

References:

1. Patent no. US9714908B2

2. Rafiei, M. and Kennedy, M. (2019) Nature Communications.10:3448.

Choosing the correct SEM for your imaging requirements

E. Venter and S. Harper

JEOL, UK, 1-2 Silver Court, Watchmead, Welwyn Garden City AL7 1LT, United Kingdom

Corresponding Author E-mail: eudri.venter@jeoluk.com

JEOL has been a partner to the South African microscopy community for over two decades - a community that has benefitted from continuous technological advances and innovations in the field of the scanning electron microscopy (SEM) imaging. The InTouchScope™ SEM series, designed with ease-of-use and automation in mind, has been successfully phased in over the past decade. We present a comparison of the SEM range, highlighting optimal solutions to any imaging requirement for a modern laboratory within the research, industrial or manufacturing sectors. The tungsten thermionic filament source SEMs comes in two chamber size varieties, namely the small chamber IT200 and large chamber IT510. These instruments benefit from a small installation footprint, integrated energy dispersive x-ray spectroscopy (EDS) and user-friendly stage navigation options. The IT700HR combines the ease of- use and intuitive operation of a tungsten SEM with the performance of a field emission (FE) SEM. The Schottky-emission electron gun, installed in all the FE-SEM instruments, features an excellent lifetime, high brightness, and maximum probe currents reaching a few hundreds of nA. For automation of data acquisition over large-scale multi-ROI experiments (for e.g,

montaging and volume EM experiments such as array tomography and serial block face SEM), companion software from Systems In Frontier Inc. allows easy experimental setup. The IT800 range offers a choice between a semi in-lens and a hybrid electromagnetic/electrostatic field objective lenses, a wide range of detectors (filtered and conventional), and comes standard with beam deceleration capabilities, allowing full customisation for the highest resolution imaging requirements.

Next generation hardware and powerful software for Energy Filtered TEM and EELS Spectroscopy

P. Spellward

Gatan Inc.

Corresponding Author E-mail: paul.spellward@ametek.com

Gatan pioneered post column EELS spectrometers and Gatan energy filters and has brought such systems to users of all TEM brands for more than 40 years. New developments are continuously occurring, both in hardware but also in the workflow software which is key to the modern user experience for productive TEM work. The fifth-generation systems, the Continiuum imaging filter (GIF) and Spectrometer bring new levels of stability, speed / productivity, dose efficiency and are highly configurable with cameras of several types. Furthermore, Gatan provides highly powerful and productive software, generally regarded as the industry standard, which includes Gatan scripting plus control via Python. The Continiuum GIF can be deployed with the K3 direct detector, for high voltage EELS and all imaging modes with the benefits of direct detection: speed, sensitivity, noise performance and dose efficiency. A hybrid pixel detector, Gatan's STELA system, can be installed, enabling energy filtered diffraction and low voltage EELS. Standard scintillator cameras still have a role to play and can be optimised by voltage range. These systems are truly multi-capability, the "Swiss Army Knife" of TEM. The talk will discuss the technologies, applications and workflows brought through the Gatan environment.

Correlative Indexing with Dynamic Template Matching –Hybrid EBSD indexing beyond Library or Spherical Indexing

K. Dicks and P. Trimby

Oxford Instruments NanoAnalysis, Halifax Rd, High Wycombe, Bucks, HP12 3SE, UK

Corresponding Author E-mail: keith.dicks@oxinst.com

Commercial electron backscatter diffraction (EBSD) systems have, for many years, used the Hough transform for the analysis and indexing of EBSD patterns (EBSPs). Hough-Indexing (HI) is highly optimised, fast and delivers excellent data across all EBSD applications. However, the development of effective EBSP simulations using dynamical electron diffraction theory has resulted in alternative indexing methods, such as Dictionary or Spherical indexing (DI/SI). These methods correlate experimental patterns with simulations, enabling effective indexing of extremely poor quality EBSPs, albeit with significant computational overheads. An alternative to DI or SI is a hybrid approach, using the results from HI for subsequent refinement using pattern matching. This combines the benefits of both methods. Hybrid pattern matching has been implemented in AZtecCrystal MapSweeper to deliver a fast, effective analysis tool enabling: Improved angular precision down to 0.01° Improved discrimination of crystallographically similar phases Indexing of EBSPs that could not be indexed using HI New information, such as crystal polarity/phase domains MapSweeper uses a fully dynamic approach to indexing, generating the necessary pattern simulations as required – this method, known as "Dynamic Template Matching" (DTM) has multiple benefits over DI/SI, such as immediate set up, effective analysis of complex, multi-phase materials and a robust, transparent metric for data quality using the normalised cross correlation coefficient.

Advances in EBSD acquisition and analysis with new systems from EDAX

P. Spellward

EDAX Inc.

Corresponding Author E-mail: paul.spellward@ametek.com

Electron Back Scattered Diffraction (EBSD) is an increasingly used tool in materials science, earth science and industry. There is continuous demand for faster acquisition speeds but also to extend the technique to beam sensitive materials. Collecting data is one thing but analysing and indexing it reliably is another. EDAX has addressed the current challenges in EBSD through both new hardware and continuing development of powerful software. The talk will present the new EBSD systems and also briefly cover the EDAX EDS systems, which can be co-installed with EBSD and thus offer a single acquisition platform for analytical SEM work. EDAX's Velocity Ultra is the fastest commercial EBSD system in the market, up to 6700 patterns per second, collecting EBSD maps in minutes for efficient SEM use, in-situ experiments, and 3D EBSD applications. Combining the Velocity hardware with EDAX's OIM analysis software and additional capabilities such as Neighbour Pattern Averaging & Reindexing (NPAR) brings unique and powerful tools to your EBDS work. The world's first direct detection EBSD capability, the EDAX Clarity system, is bringing EBSD to previously impossible materials, notably beam sensitive samples, insulating samples and work at voltages down to 3 kV.

New advances in micro-computed tomography using spectral CT scanning

W. De Boever and H. Fernandes

TESCAN, Brno, Czech Republic

Corresponding Author E-mail: wesley.deboever@tescan.com

Micro-CT is a unique tool for providing non-destructive 3D information on samples ranging from millimeters to tens of centimeters, at typical resolutions of a few µm or just below. Since the contrast in conventional micro-CT depends mainly on differences in atomic number, only relative differences in composition between higher and lower average atomic number materials can be obtained. With the introduction of spectral CT, it is now possible to complement high quality structural information obtained with conventional micro-CT, with true chemical information within the same system. This work shows how spectral CT can be used to increase contrast between low-attenuating polymers, which is not possible using only conventional CT. We also demonstrate the ability of spectral CT to positively identify heavy elements such as cadmium, tungsten, or tantalum, without any prior knowledge on the sample. The results show the huge potential of spectral CT as an addition to existing micro-CT workflows, providing more contrast and information than before using laboratory-based micro-CT systems.

High spatial resolution X-ray microscopy - a new technology approach for the research laboratory

M.S. Khoshkhoo

Carl Zeiss Microscopy GmbH

Corresponding Author E-mail: mohsen.samadi@zeiss.com

The progress of scientific research and technology development depends heavily on the effective imaging solutions to characterize the properties and behaviors of materials. Revealing details of microstructure, ideally in 3D, is a critical part of this understanding, whether developing and confirming models that describe material properties and behavior, or simply visualizing structural details. ZEISS offers 3D X-ray microscopes (XRM): advanced imaging solutions that have overcome major hurdles to three-dimensional imaging by providing high-contrast, sub-micron imaging, even for relatively large samples. These breakthrough advances in nondestructive, three-dimensional (3D) imaging enable a wide range of technical and scientific disciplines. The nondestructive nature of X-ray microscopy (XRM) enables

multiscale or multimodal imaging of the same sample for analysis the hierarchical structures. Two families of X-ray microscopes are available for this purpose and will be presented in this talk. These include the Zeiss Xradia Versa and Zeiss Xradia Ultra laboratory-based X-ray microscopes. They provide the highest resolution for the study of internal structures at true spatial resolutions from submicron (< 500 nm for Versa) to nanometer (< 50 nm for Ultra). 3D-XRM architectures feature several key advantages, including characterization of large samples without loss of resolution, high contrast for improved clarity, minimal sample preparation, the ability to perform in situ experiments, and synchrotron-quality imaging in a laboratory system. Whereas traditional CT systems rely on single-stage geometric magnification, Xradia Versa features a combination of unique two-stage magnification optics and a high flux X-ray source to produce faster sub-micron scale resolution images across the widest range of intact sample sizes and types. In addition, it provides excellent contrast capabilities through different imaging modes, i.e., (i) absorption, (ii) absorption and propagation phase contrast, (iii) dual-energy scanning modes, and (iv) diffraction contrast tomography. On the other hand, the innovative Xradia Ultra architecture, with unique X-ray optics adapted from synchrotron technology, features absorption and phase contrast resolving the microstructure down to a spatial resolution of 50 nm. These unique features make all families of X-ray microscopes powerful tools for applications in a very wide range of scientific and industrial fields. Correlative workflow from XRM to FIB-SEM is also presented as a unique technique for comprehensive multiscale characterization of many samples.

Advanced Gallium-free (S)TEM sample preparation with multiple ion species FIB

D. Phifer

Thermo Fisher Scientific, Eindhoven, NL

Corresponding Author E-mail: daniel.phifer@thermofisher.com

With the release of Helios 5 Hydra, plasma FIB has extended the low voltage polishing to 500V which can be done with any of the available ion species. Previously the lower limit for ion voltage was 2kV. This lower accelerating voltage range is proving to be quite beneficial to preparation of even better TEM lamella. Xenon is the best ion species for fast removal of large areas due to the relatively large ion size and the lower range of penetration into substrates at high energies. Argon, however, is proving to be an excellent choice for the low kV polishing of lamellas to minimize the amorphous damage region on both sides of the lamella. In initial tests, Van Leer et al was unable to measure the amorphous region after 500V cleaning as presented in vendor demonstrations during M&M 2021. Chengge Jaio, a research scientist at Thermo Fisher, worked hard to determine why this was the case and show how both the ion range and the energy play a role in reducing the dislocations introduced into a material during ion milling. He used SRIM estimates and models alongside experimentation to show that the ion range and species makes a significant difference (MRS Webinar 21 Nov 2021, “Towards “Damage-Free” TEM specimen preparation by Focused Ion Beam without Gallium”). Generally, kV below 1.5 should be used for finishing lamella and the ion choice makes a difference due to speed, size and associated penetration range into the material. His investigation leads to the current “best of the best” recommendation to use Xenon for the bulk removal steps and switch to 500-1500V Argon ions for the final steps to minimize damage and maximize the intact crystalline material in a (S)TEM sample prepared by FIB.

BELL 430 helicopter accident investigation: The role of advanced microscopy and microanalysis

C.J.C. Snyman

Laboratory for Microscopy and Microanalysis, University of Pretoria, Pretoria, Dept. of Physics, University of Pretoria, Republic of South Africa

Corresponding Author E-mail: coenraad.snyman@up.ac.za

A South African EMS Bell 430 helicopter crashed resulting in 5 fatalities. The SA Civil Aviation Authority requested a forensic analysis to support the investigation as part of their AAI to augment Aviation Safety. The purpose was to determine the primary failure mode of a failed Pitch Control Link during operation. The 4X Main Rotor PCL’s are defined as Primary Structural Elements critical to the safe operating of the aircraft. The methodology involved visual- and low magnification inspection, sample preparation followed by high magnification analysis involving Scanning Electron

Microscopy using a Zeiss 540 Crossbeam FEGSEM fitted with an Oxford Energy Dispersive Spectroscopy system. The low-magnification inspection revealed the clevis failed within the threaded section with two distinct initiation sites and progressing towards a final, fast fracture. Both the initiation sites corresponded with corrosion pits induced by the operating environment resulting in surface stress raisers detrimental to the fatigue fracture resistance of the material. At higher magnifications the fracture surface zones around the initiation sites revealed a combination of inter- and trans-granular morphologies consistent with Stress Corrosion Cracking acting as a precursor to a fatigue fracture mode till final fracture. The clevis was exposed to a non-destructive inspection (NDI) involving Magnetic Particle Inspection (MPI) at the required intervals. The microscopy analysis revealed fracture geometries that should have been detectable by MPI. The Probability of Detection using MPI on parts manufactured from a material such as 15-5PH Stainless Steel needs to be further investigated.

The African BioImaging Consortium: a microscopy community for biomedical researchers in Africa

M. Reiche

University of Cape Town

Corresponding Author Email: mike.reiche@uct.ac.za

The African BioImaging Consortium (ABIC) is a newly established network of life science and biomedical researchers throughout Africa with a common interest in microscopy. This community-driven initiative aims to unite African imaging researchers and support the development of bioimaging across the continent. ABIC activities focus on a series of goals, which include: 1) harnessing the collaborative effort of experts throughout Africa in strengthening microscopy across the continent; 2) creating a central hub and network for opportunity sharing, microscope advocacy, information sharing, and collaboration; 3) providing a platform from which hurdles facing the bioimaging in Africa can be identified, understood, and addressed by the collective community; 4) promoting the African microscopy community and its researchers and ensuring engagement with the global microscopy community. Participation in ABIC is open to all researchers working with (electron or light) microscopy in the life and biomedical sciences. The community seeks to unify and connect researchers from diverse scientific backgrounds such as biology, data and computer science, chemistry, imaging, as well as physics. We encourage scientists in Africa from all career phases from to take an active role in the community with ABIC.

Introducing the Mica Microhub Imaging System from Leica Microsystems

H. Moodley

Leica Microsystems, Separations, 9 Will Scarlet Road, Robindale, Johannesburg 2194

Corresponding Author E-mail: holisha@separations.co.za

Introducing the Mica Microhub Imaging System from Leica Microsystems Mica, the world's first Microhub, is a completely new imaging system designed so that everyone can leverage microscopy to make discoveries. The world's first Microhub has arrived. More than a highly automated microscope, Mica unites widefield and confocal imaging in a sample-protecting, incubating environment. With the simple push of a button, you have everything you need—all in one place—to supercharge fluorescence microscopy workflows and streamline your path to results. See how Mica brings you Access for All, No Constraints, through Radically Simplified Workflows. Access for All: With the push of a button, you are ready to go. Mica guides you to the results you are aiming for as it radically simplifies the whole experiment from acquisition to analysis. Mica eliminates over 85% of the tedious set up steps that require expertise. Now everyone can leverage microscopy to make more discoveries. No Constraints: Everything you need to enable discoveries, unified in one easy-to-use system. Now you can select the right modality in real time as Mica allows you to seamlessly move from fast overview to high resolution when required by your experiment. Capture all 4 labels of different structures in a single acquisition for both widefield and confocal. Simultaneous acquisition of multiple labels boosts the speed of acquisition by up to 4 times and ensures 100% spatiotemporal resolution. Radically Simplified Workflows: Mica brings you faster from sample to discovery by reducing 60% of process steps through system intelligence. With Mica, you can

reduce time and effort by radically simplifying your workflow into as few as 8 steps from sample to insight through system intelligence

Thermo Fisher Scientific Cryo-EM workflows; Developed for the masses

G. Sharma, I. Martín and D. Ugurlar

Thermo Fisher Scientific

Corresponding Author E-mail: sharma.gaurav@thermofisher.com

As cryo-electron microscopy (cryo-EM) continues to mature, an increasing number of researchers from around the world use this cutting-edge technique to gain insight into many of today's leading scientific research. Scientists use cryo-EM because of its unique ability to examine samples at high resolution in their near-native state, which is leading to breakthrough discoveries. As cryo-EM instruments become easier to use while generating higher resolution results, these discoveries are taking place at an unprecedented pace. From neurodegenerative diseases such as Alzheimer's and Parkinson's to infectious diseases such as COVID-19, cryo-EM is leading to new discoveries that are pushing the boundaries of research. Several recent studies have used cryo-EM to uncover structures related to SARS-CoV-2, the strain of coronavirus that causes the COVID-19 disease. Scientists at Regeneron used cryo-EM to determine the structural features of individual antibodies (REGN10933 and REGN10987) that simultaneously bind the receptor-binding domain of the spike protein, accelerating the development of a SARS-CoV-2 therapeutic antibody cocktail that has moved into human trials.

Delong America Company Profile

B. Barkay

Delong Instruments, 4020 St. Ambroise Suite 473, Montreal, Quebec, Canada.

(BennyZA are the authorised distributor for Delong Instruments in South Africa)

Corresponding Author E-mail: sales@benny.co.za

Delong Instruments are the current world leader in benchtop low-voltage transmission electron microscopy (TEM). We will explore the capabilities, limitations, and advantages of benchtop TEMs compared to conventional TEM. We will expand on the operability and ergonomics that a benchtop TEM provides. The Delong Instrument LV5, LV25 and LV25E will be briefly discussed and compared. We will be exploring the applications of the equipment and presenting evidence-based use of the device. We will demonstrate the size of the product through our available mock-up. We will also briefly discuss the turnkey solutions we provide to optimize efficiency within the research environment.

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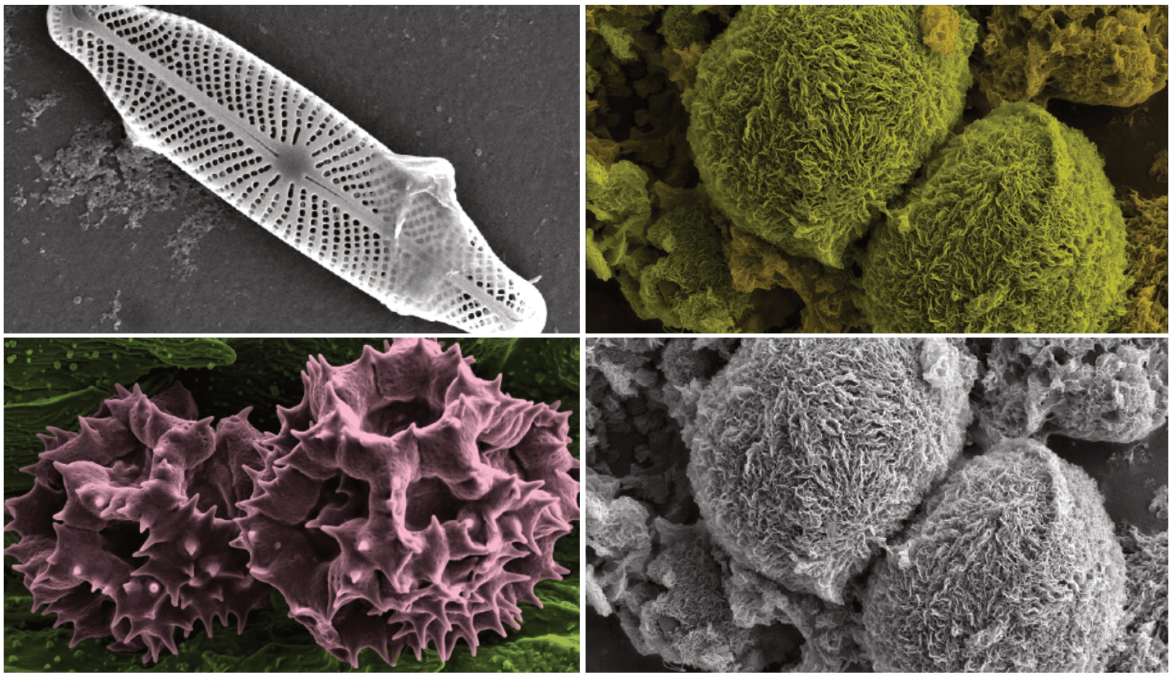

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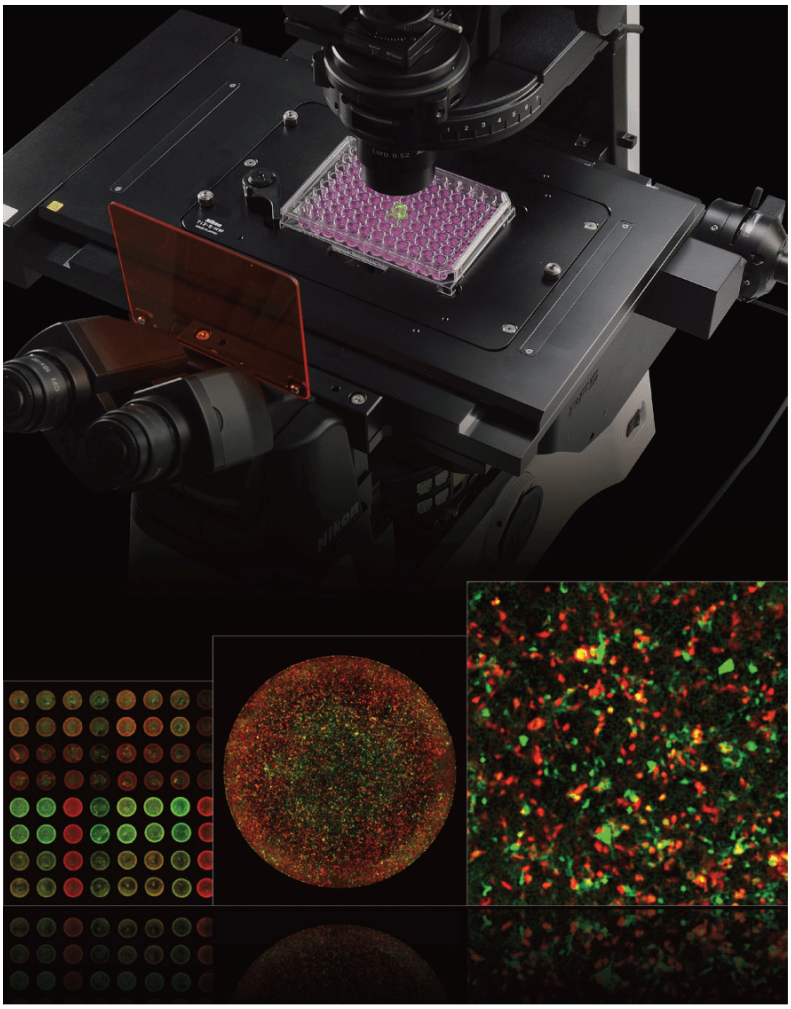

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TUESDAY 6 DECEMBER - MORNING	
7.30-8.00	**REGISTRATION** **Oppenheimer Entrance Foyer**
8.10-8.30	**WELCOME AND OPENING** Venue: Plenary/MS Hall (Oppenheimer Conference Room 2) **Prof Lesley Cornish** *Chair: Dr Jaco Olivier / Prof Rodney Genga*
8.30-8.50	**Conference Announcements and Address** Venue: Plenary/MS Hall (Oppenheimer Conference Room 2) Dr Jaco Olivier, MSSA President
8.50-9.50	**41st JOHN MATTHEWS MEMORIAL LECTURE** Venue: Plenary/MS Hall (Oppenheimer Conference Room 2) LOW-VOLTAGE SCANNING ELECTRON MICROSCOPY: THE SECRETS OF ION-IRRADIATION INDUCED DAMAGE REVEALED Dr Iwona Jóźwik *Chair: Dr Jaco Olivier / Prof Rodney Genga* *Plenary Speaker sponsored by:*
09.50-10.20	**COFFEE BREAK**

SESSION 1	**Venue:** Plenary/MS Hall (Oppenheimer Conference Room 2) *Chair: Dr Johan Westraadt*	**Venue:** LS Lecture Hall (Oppenheimer Conference Room 3) *Chair: Prof Chantélle Baker*
10.20-10.50	**KEYNOTE** SHI INDUCED BULK ROTATION IN NON-AMORPHIZABLE TARGETS: A NiO CASE STUDY J.H. O'Connell, D.A. Douglas-Henry	**KEYNOTE** C.H. Pohl
10.50-11.10	MOLECULAR DYNAMICS AND TEM INVESTIGATION OF SWIFT HEAVY ION TRACKS IN INSULATORS R.A. Rymzhanov, J.H. O'Connell, N. Medvedev, A. Janse van Vuuren, V.A. Skuratov, A.E. Volkov	NOVEL INSIGHTS INTO THE GENUS *LEIOTROCHA* (MOBILIDA: URCEOLARIIDAE) G.P. de Jager, L. Basson, S. Colin and C. Feldhaus
11.10-11.30	THERMODYNAMIC PARAMETERS FOR THE STABILIZATION AND TRANSFORMATION OF TETRAGONAL SHI TRACKS IN MONOCLINIC ZIRCONIA M.E. Lee, J.H. O'Connell, V.A. Skuratov	CHARACTERISTIC CAVITIES NO LONGER VALID J. Hastings, L. Basson and G.P. de Jager
11.30-11.50	ANNEALING - INDUCED MICROSTRUCTURAL CHANGES FOR SHI TRACKS IN POLYCRYSTALLINE SILICON NITRIDE A. Ibrayeva, J.H. O'Connell, A. Janse van Vuuren, V.A. Skuratov	MICROSTRUCTURE OF TOOTH ENAMELOID IN TWO SHARK SPECIES M.E. Waldron, J. Wilmers and S. Bargmann
11.50-12.10	A HIGH-RESOLUTION TEM STUDY OF THE INTERACTION OF SWIFT HEAVY IONS WITH INSULATORS A. Janse van Vuuren, A. Ibrayeva, J.H. O'Connell, R. Rymzhanov, V.A. Skuratov, M. Zdorovets	PARASITIC FISH PROTISTS - FROM BAD TO GLAM TO DOWNRIGHT PECULIAR L. Basson
12.10-12.30	THE INFLUENCE OF ZrB_2 ADDITIVES ON THE THERMAL STABILITY OF POLYCRYSTALLINE DIAMOND M. Jivanji, D. Aldmington, J.E. Westraadt	

12.30-14.00	**LUNCH** **Venue:** Barney's Restaurant

TUESDAY 6 DECEMBER - AFTERNOON

SESSION 2	**Venue:** Plenary/MS Hall (Oppenheimer Conference Room 2) *Chair: Prof Mike Lee*	**Venue:** LS Lecture Hall (Oppenheimer Conference Room 3) *Chair: Dr Albe Swanepoel*
14.00-14.20	DYNAMIC RESTORATION MECHANISM OF Ti-0.162, Nb-0.394, Al-0.068, Fe 441 FERRITIC STAINLESS STEEL DURING HOT ROLLING J.T Asante, C.W Siyasiya	ANTISECRETORY FACTOR (AF16) AS A POTENTIAL THERAPEUTIC AGENT IN A MODEL OF TRAUMATIC BRAIN INJURY N. Heathcote, J. Kriel and B. Loos
14.20-14.40	PRECIPITATE EVOLUTION DURING HOT ROLLING & IT'S IMPLICATION ON RECRYSTALLISATION IN 436 STAINLESS STEELS M.Y. Salojee, C.W. Siyasiya, K.A. Annan, J.S. Moema	*IN VITRO* EFFECTS OF MAZ-51 IN COMBINATION WITH EGCG IN MELANOMA CELLS C.C. Nadasen, J.C. Serem, Y.N. Hlophe and K. Ncube
14.40–15.00	MICROSTRUCTURAL BASED LIFE ASSESSMENT OF 1CrMoV TURBINE ROTOR STEELS AFTER LONG-TERM SERVICE H.S. Nyembe, J.H. Neethling, J.E. Westraadt	MICROSTRUCTURE OF COMMONLY USED AUTOGRAFTS FOR ACL RECONSTRUCTION: QUADRICEPS, PATELLAR AND SEMITENDINOSUS TENDONS S. Latiff and O. I. Olateju
15.00-15.20	SIMULATION OF LONG-TERM HIGH TEMPERATURE EXPOSURE OF X20 STEEL THROUGH LABORATORY ACCELERATRED AGEING S. Allies, R.D. Knutsen, J.E. Westraadt	AN *IN VITRO* INVESTIGATION OF KYNURENINE COMPOUNDS ON MELANOMA GROWTH AND INTRACELLULAR MORPHOLOGY C. Basson, J. Serem, P. Bipath and Y. Hlophe
15.20–15.40	MULTISCALE FEATURE ENGINEERING FOR MACHINE LEARNING STRUCTURE-PROPERTY MODELS FOR CARBON STEELS L. Westraadt, J.E. Westraadt	
15.40-16.00	**COFFEE BREAK**	

16.00-17.00	**Life Sciences Workshop** Around the Light Microscope in 60 min: A Learning Zone Chalk and Talk - Dr James Wesley-Smith **Venue:** LS Lecture Hall (Oppenheimer Conference Room 3)	
SESSION 3	**Venue:** Exhibition Hall (Oppenheimer Conference Room 1) **MS - POSTER SESSION 1** *Chair: Dr Jacques O'Connell*	**Venue:** Oppenheimer Lobby 2 (Entry from Exhibition Hall) **MS - POSTER SESSION 2** *Chair: Prof Rodney Genga*
16.00-16.05	DISLOCATION DENSITY MEASUREMENT IN AISI316L STAINLESS STEEL USING ELECTRON CHANNELING CONTRAST IMAGING (ECCI) L.C. Pullen, J.E. Westraadt, D. Ramasimong, R.D. Knutsen	STUDY OF THE IMMOBOLISATION OF PALLADIUM BY SILICON AND ZIRCONIUM IN GRAPHITE G. Mtwazana, A. Janse Van Vuuren, J.H. Neethling
16.05-16.10	STRUCTURAL CHARACTERIZATION OF AMORPHOUS AND CRYSTALLINE MOLYBDENUM PHOSPHIDE CATALYSTS FOR HYDROGEN EVOLUTION REACTION S.S. Nkabinde, N. Moloto	CHEMICAL ANALYSIS OF NANO-SIZED STEEL PRECIPITATES USING SCANNING ELECTRON MICROSCOPY N.W. Mfuma, W.E. Goosen, J.E. Westraadt
16.10-16.15	STRUCTURAL MODIFICATION OF ZSM-5 NANOSHEETS BY PHOSPHORUS-TREATMENT FOR C16 HYDROCRACKING REACTIONS T. Tahier, P.J. Kooyman	SCANNING TUNNELING MICROSCOPY: INSIGHTS FROM FIRST PRINCIPLES CALCULATIONS A.M. Ukpong
16.15-16.20	SYNTHESIS OF NOVEL MICRO AND NANOSTRUCTURED MIXED-METALS OF WO_3 PHOTOCATALYSTS FOR THE REDUCTION OF CO_2 M. Mgolombane, E.J. Olivier, A.S. Ogunlaja	DEVELOPMENT AND CHARACTERISATION OF ANTIBACTERIAL TITANIUM-BASED ALLOYS WITH COPPER FOR BIOMEDICAL APPLICATIONS L. Spotose, N.S. Phala, C. Polese, L.A. Cornish
16.20-16.25	DEVELOPMENT OF HYDRODESULFURIZATION CATALYSTS FOR THE REFRACTORY SULFUR COMPOUNDS: EFFECT OF CHELATING LIGANDS AND SUPPORT S. Majodina, Z.R. Tshentu, E.J. Olivier, A.S. Ogunlaja	ANALYSIS OF $In_xGa_{1-x}As$ EPILAYERS BY INFRARED SPECTROSCOPY AND ELECTRON MICROSCOPY J.A.A. Engelbrecht, S. McKee, W.E. Goosen, E.G. Minnaar, A. Janse van Vuuren

16.25-16.30	STRUCTURAL EFFECTS OF HIGH-ENERGY HEAVY ION IMPACT IN NANOCRYSTALLINE Y-Ti-O AND Y-Al-O A. Ibrayeva, A. Mutali, J.H. O'Connell, A.S. Sohatsky, V.A. Skuratov, I. Ivanov	MICROSTRUCTURE AND MECHANICAL PROPERTIES OF CREEP-EXHAUSTED 14MoV6-3 STEEL AFTER REGENERATIVE HEAT TREATMENT T. Masole, L.A. Cornish, M.O. Bodunrin

16.30-16.35	EFFECT OF SHI IRRADIATION ON MICROSTRUCTURAL CHANGES OF SELENIUM IMPLANTED POLYCRYSTALLINE SILICON CARBIDE T.S. Mabelane, Z.A.Y. Abdalla, T.T. Hlatshwayo	THE SYNTHESIS AND CHARACTERIZATION OF GOLD@TIN(IV) OXIDE NANOCOMPOSITE MATERIALS T. Makgale
16.35-16.40	MICROSTRUCTURAL EVOLUTION OF POLYCRYSTALLINE SILICON CARBIDE CO-IMPLANTED WITH SILVER AND HELIUM AT 350 °C S.Z. Mtsi, Z.A.Y. Abdalla, T.T. Hlatshwayo	INFLUENCE OF COATING TECHNIQUES ON THE STRUCTURAL AND OPTICAL PROPERTIES OF Fe_2O_3 NANOSTRUCTURES A. Holtzhausen, M.M. Diale
16.40-16.45	INFLUENCE OF Ag^+ ION IMPLANTATION ON THE MORPHOLOGY OF ZnO NANORODS K. Lefatshe, D. Sebuso, M. Madhuku, C. Muiva	EFFECTS OF MECHANICAL ALLOYING ON SPARK PLASMA SINTERING OF Fe-Ni-Si POWDERS B.L. Bayode, A.O. Ogunmefun, T.S. Tshephe, M.M. Ramakokovhu and Peter Olubambi
16.45-16.50	EFFECT OF MICROSTRUCTURE ON CORROSION BEHAVIOR OF AISI 316 L STAINLESS STEEL IN SIMULATED BODY FLUID. N.K. Ngeleshi, B.A. Obadele , B.C. Mashabela, X.F. Nukeri, P.A Olubambi	IMMERSION STUDIES OF PLASMA SPRAYED HYDROXYAPATITE COATINGS DEPOSITED ON GEOMETRICALLY DIFFERENT Ti-6Al-4V ALLOY SUBSTRATES U. Dockrat, T.T. Thabethe, J.B. Malherbe, T. Nstoane
16.50-16.55	ASSESSMENT OF THE SIZE OF NANOPARTICLES BY USING X-RAY DIFFRACTION AND SCANNING ELECTRON MICROSCOPY T.M. Abdalkreem, R.E. Kroon, H.C. Swart	COROSION BEHAVIOUR OF AUSTENITIC LOW-DENSITY STAINLESS STEELS IN SIMULATED BODY FLUIDS M.O. Bodunrin, A. Dladla, N. Rundora, D.E.P Klenam

16.55-17.00	BACK-ANNEALING OF HOT DIP GALVANISED STRIP STEEL MICROALLOYED WITH VANADIUM J.S. Steyn, J.E. Westraadt, K.M. Banks, C.W. Siyasiya, R.J. Mostert	TUNING PREPARATION - INDUCED RELAXATION DYNAMICS IN HETEROGENEOUS POLYMER FILMS A. A. Mulama, A. O. Oduor, G. Reiter

17.00-17.05	ANALYSIS OF NANOCRYSTALLINE DIAMOND LAYERS DEPOSITED ON ZIRLO S. Ngongo, A. Janse van Vuuren, J. H. Neethling, I. Kratochva	MICROSTRUCTURE EVALUATION OF Ti-35Nb-10ZrO-5Ta-xCu PREPARED BY SPARK PLASM SINTERING FOR BOIMEDICAL APPLICATION R.A Busang, M.L. Teffo, B.L. Bayode, B.J. Babalola[2]
17.05-17:10	SYNTHESIS AND CHARACTERIZATION OF TiO_2@Co_xO_y CORE-SHELL NANOPARTICLES FOR USE IN FISCHER TROPSCH SYNTHESIS R. Rikhotso, E.J. Olivier, G. Mhlongo and A. Govender	CHARACTERISATION OF VO_X/MgO CATALYSTS PRODUCED USING SOLUTION COMBUSTION SYNTHESIS: MIXED FUEL APPROACH S. Padayatchee, H.B. Friedrich, P.Ntola, E.J. Olivier and A. Govender
17.10-17:15	CARBON FIBERS GROWN FROM A COPPER NANOPARTICLE ENCAPSULATED WITHIN HOLLOW CARBON SPHERES M.S Maubane-Nkadimeng, P.M. Gangatharan and N.J Coville	
17.15-18.15	**Poster Sessions Q & A**	

19.00	**Braai Evening** Venue: Gold Reef City Old Town Street (next to Barney's Restaurant) **Sponsored by** **Zeiss Microscopy**	ZEISS Seeing beyond

WEDNESDAY 7 DECEMBER - MORNING

7.30-8.30	**REGISTRATION** **Oppenheimer Entrance Foyer**

8.30-9.30	**34th BORIS BALINSKY L ECTURE** Venue: Plenary/MS Hall (Oppenheimer Conference Room 2) **MULTISCALE-MULTIMODAL IMAGING OF THE BRAIN: REVEALING SECRETS HIDING IN PLAIN SIGHT** PROF Mark H. Ellisman *Chair: Dr Deran Reddy*
9.30-10.00	MAKING EVERY ELECTRON COUNT: APPLICATIONS OF LOW DOSE ELECTRON PTYCHOGRAPHY **PROF. A. Kirkland** *Chair: Dr Deran Reddy*
10.00-10.30	**COFFEE BREAK**

SESSION 4	**Venue:** Plenary/MS Hall (Oppenheimer Conference Room 2) *Chair: Dr Velile Vilane*	**Venue:** LS Lecture Hall (Oppenheimer Conference Room 3) *Chair: Dr James Wesley-Smith*
10.30-11.00	**KEYNOTE** UNDERSTANDING THE PROCESS-STRUCTURE RELATIONSHIP OF VOx/MgO CATALYSTS PREPARED BY SOLUTION COMBUSTION SYNTHESIS USING TEM P. Ntola, H.B. Friedrich, A.S. Mohamed, E.J. Olivier, A. Govender and S. Singh	**KEYNOTE** MORE THAN JUST A PRETTY PICTURE: EXPLORING THE TRUE IMPORTANCE OF MICROSCOPY A.C. Swanepoel
11.00-11.20	STUDY OF THE EFFECTS OF PROMOTERS (MnO_X and FeO_X) ON CoO_4/CeO_2 DURING CO-PROX N. Ndila, M. Jensen, P.J. Kooyman	THE EFFECT OF CALCITRIOL ON CLOT FORMATION AND STRUCTURE IN PROSTATE CANCER J. Bester, M. Schultz and M. Hoek
11.20-11.40	HR-EBSD ANALYSIS OF IN SITU STABLE CRACK GROWTH AT THE MICRON SCALE A. Koko, T.H. Becker, E. Elmukashfi, N.M. Pugno, T.J. Marrow	INVESTIGATING THE EFFECTS OF COVID-19 VACCINES ON THE COAGULATION SYSTEM C. Venter and E. Pretorius
11.40-12.00	CHARACTERISATION OF TRANSPARENT CONDUCTIVE OXIDES USING TRANSMISSION KIKUCHI DIFFRACTION J.E. Westraadt, U. Heitmann	FIBRINALOID MICROCLOTS AND HYPERACTIVATED PLATELETS IN MYALGIC ENCEPHALOMYELTITIS/CHRONIC FATIGUE SYNDROME J.M. Nunes and E. Pretorius
12.00-12.20	TEM STUDY OF THE NANOSTRUCTURE AND PHASE OF THE Ag-Pt SYSTEM J.H. Neethling, J.H. O'Connell, E.J. Olivier, S. Allies	EVALUATION OF APOPTOTIC IMPACT OF ATORVASTATIN ON PERIPHERAL BLOOD MONONUCLEAR CELLS INFECTED WITH *M. tuberculosis* S. Sabeel, B. Motaung and R. Guler
12.20-14.00	**LUNCH** **Venue:** Barney's Restaurant	

SESSION 5	**Venue:** Plenary/MS Hall (Oppenheimer Conference Room 2) *Chair: Prof Rob Knutsen*	**Venue:** LS Lecture Hall (Oppenheimer Conference Room 3) *Chair: Dr Chantelle Venter*	
14.00-14.20	EFFECTS OF FEMTO-LASER CHIP BREAKER AND Ni-Mo BINDERS ON AISI1213 TURNING USING NbC-BASED INSERTS R.M. Genga, P. Zeman, J. Brajer, J. Malý, T. Primus, M. Pešice, S. Huang, J. Vleugels, S. Ngongo, A. Janse van Vuuren	NECTAR SPUR DEVELOPMENT IN Nemesia (SCROPHULARIACEAE) H. Grobler, M. Jackson, and L. Joubert	
14.20-14.40	IN-SITU TEM HEATING INVESTIGATION OF FISSION PRODUCT TRANSPORT IN POST IRRADIATED PBMR TRISO PARTICLE SIC LAYERS E.J. Olivier, J.H. Neethling and J.H. O'Connell	TRANSLOCATION, FATE AND BIOACCUMULATION STUDY OF MICRO- AND NANOPLASTICS IN MICE MODEL ORGANISMS A. Gada, S. Muniyasamy, P. Hlangothi, P. Melariri and C. Hoyo	
		LS - POSTER SESSION	
14.40-15.00	TOOL LIFE OF NbC-BASED CERMETS DURING FACE MILLING OF AUTOMOTIVE GCI M.S. Rabothata, N.P. Mphasha, K. Phaka, P. Zeman, R.M Genga, C. Polese, S. Huang, J. Vleugels	14.40-14.50	THE MORPHOANATOMY AND HISTOCHEMISTRY OF THE FOLIAR TRICHOMES OF *Combretum apiculatum* Sond. subsp. *apiculatum* (COMBRETACEAE) M. Parusnath and Y. Naidoo
15.00-15.20	EFFECTS OF TiC_7N_3 ADDITIONS AND SINTERING TECHNIQUE ON THE MICROSTRUCTURAL PROPERTIES OF NbC-BASED CERMETS M.S. Rabothata, N.P. Mphasha, R.M. Genga, C. Polese, P. Zeman, S. Huang, J. Vleugels, A. Janse van Vuuren, N.B. Nelwalani	14.50-15.00	TRICKY TRICHODINIDS WITH DAUNTING DENTICLES J. Hastings, L. Basson and G.P. de Jager
15.20-15.40	PRODUCTION OF $SrVO_3$ THROUGH CO-PRECIPITATION SYNTHESIS AND ANNEALING IN REDUCING ATMOSPHERE E. Lee, R.A. Harris, J.J. Terblans, H.C. Swart	15.00-15.10	A PRELIMINARY INVESTIGATION ON THE MORPHO-HISTOCHEMICAL ATTRIBUTES OF THE MEDICINAL PLANT, KEDROSTIS NANA (LAM.) COGN K. Doolabh and Y. Naidoo
15.40-16.00	SINGLE ELECTRON TRANSPORT IN SEMICONDUCTOR NANOSTRUCTURED DEVICES N. Hanief, H. Howe, M.D. Blumenthal		
16.00–16.30	**COFFEE BREAK**		

WEDNESDAY 7 DECEMBER - AFTERNOON

16.30 -18.30	**ANNUAL GENERAL MEETING** Venue: Plenary/MS Hall (Oppenheimer Conference Room 2) Chair: Dr Jaco Olivier	
19.00	**STUDENT EVENING** Venue: Gold Reef City Old Town Street **Sponsored by** **Wirsam Scientific**	Wirsam SCIENTIFIC EVIDENT TESCAN

THURSDAY 8 DECEMBER – MORNING

7.30-8.30	**REGISTRATION** **Oppenheimer Entrance Foyer**

SESSION 6	**Venue:** Plenary/MS Hall (Oppenheimer Conference Room 2) *Chair: Dr Jaco Olivier*	**Venue:** LS Lecture Hall (Oppenheimer Conference Room 3) *Chair: Dr Janette Bester*
08.30-09.00	**KEYNOTE** TEM TOMOGRAPHY AT ROOM TEMPERATURE A. Ziegler	**KEYNOTE** APPLICATION OF ANIMAL MODELS IN HEAVY METAL TOXICITY RESEARCH H.M. Oberholzer
09:00–09:20	AN IN-SITU HEATING TEM INVESTIGATION OF CELL FORMATION IN THE AA5182 ALUMINIUM ALLOY G.K. Morrison, J. E. Olivier, C. Lang, N. Nasiri, A. Janse van Vuuren, S. George	HISTOMORPHOLOGICAL EFFECTS OF MELATONIN AND cART ON THE PANCREAS AND KIDNEY IN RATS D. Venter, H. Strijdom, I. Webster and S.H. Kotzé
09:20–09:40	OPTIMIZATION OF THE ADDITION OF NIOBIUM AS A BETA STABILIZER IN A TITANIUM ALLOY FOR MEDICAL APPLICATIONS K.E. Mrwata, C.W. Siyasiya, N.K. Arthur	HISTOLOGY OF THE SOUTHERN GROUND-HORNBILL (*Bucorvus leadbeateri*) GASTRO-INTESTINAL TRACT A.D. Naudé, K.N. Koeppel and M.R. Crole
09.40–10:00	INFLUENCE OF SINTERING TEMPERATURE ON THE MECHANICAL PROPERTIES OF SINTERED ZRO_2/SI_3N_4 DOPED TI6AI4V O.A Ogunmefun, B.L Bayode, P.O Olubambi	MICROSCOPIC ARCHITECTURE OF JAPANESE QUAIL LUNGS CHALLENGED BY THERMAL EXPOSURE A. Abdulkadir and D. Reddy

10.00–10:20	WEAR BEHAVIOUR OF SPARK PLASMA SINTERED TiAl ALLOY M.R. Mphahlele, P.A. Olubambi, E. Olevsky	A MORPHOLOGICAL STUDY OF THE PULMONARY COMPONENTS IN THE LUNGS OF THE RED EARED SLIDER S. Mulder, D. Reddy and A. Abdulkadir
10.20–10:40	DEVELOPMENT OF BETA TYPE TITANIUNM BASED ALLOYS FOR DENTAL APPLICATIONS K. Dyal Ukabhai, I.A Mwamba, L.A Cornish	MICROSTRUCTURE OF THE SPLEEN OF THE SOUTHERN WHITE RHINOCEROS (*Ceratotherium simum simum*) A. Metzinger, M.R. Crole, S.J. Clift, L.C.R. Meyer, P. Buss, J. Meuffels, U. Teubenbacher and F. Pohlin
10.40-11.10	**COFFEE BREAK**	
SESSION 7	**Venue:** Plenary/MS Hall (Oppenheimer Conference Room 2) *Chair: Dr Sinoyolo Ngongo*	**Venue:** LS Lecture Hall (Oppenheimer Conference Room 3) *Chair: Dr Deran Reddy*
11.10–11:30	Ti3Al EMBRITTLEMENT IN TEMPORARY HYDROGEN ALLOYED Ti-6Al-4V V.N. Vilane, R.D. Knutsen, J.E. Westraadt	AMELIORATION OF OLFACTORY DEFICITS BY *Nigella Sativa* OIL IN DEVELOPMENTALLY MODELLED SCHIZOTYPY IN BALB/c MICE A.A. Bello and R.O. Folarin
11:30–11:50	SPINODAL DECOMPOSITION OF Ti-6Al-4V-xH MARTENSITE V.N. Vilane, R.D. Knutsen, J.E. Westraadt	25-HYDROXYVITAMIN D3 INDUCES BIOCHEMICAL AND MORPHOLOGICAL APOPTOSIS IN THE HELA CELL LINE E.V.M. Zhou, S. Bhoora, T.S. Pillay and R. Punchoo
11:50–12:10	DISLOCATION DENSITY MEASUREMENT IN FATIGUE TESTED AISI316 USING X-RAY DIFFRACTION D. Ramasimong, J.E. Westraadt, R.D. Knutsen	MODULATORY EFFECTS OF *Nigella sativa* OIL ON HIPPOCAMPUS OF DIZOCILPINE-INDUCED SCHIZOPHRENIA IN BALB/c MICE R.O. Folarin, O. Owoeye and A.O. Malomo
12:10–12:30	EFFECT OF SINTERING TEMPERATURE ON THE MICROSTRUCTURE AND HARDNESS OF LOW-DENSITY STEELS J.K. Thobejane, T. Langa, J.W. Van der Merwe, D.E.P Klenam, M.O. Bodunrin	*Nigella Sativa* OIL MITIGATED LEARNING AND MEMORY IMPAIRMENT IN *Drosophila* MODEL OF ALCOHOL DEHYDROGENASE (ADH) DEFICIENCY A.K. Akinbo, S.A. Kuye and R.O. Folarin

12:30–12:50	FORMATION OF MODIFIED Z-PHASE IN A 12Cr1MoV TMF STEEL DURING LONG-TERM CREEP W.E. Goosen, J.E. Westraadt	FRONTO-CORTICAL EFFECTS OF Nigella sativa OIL IN MPTP INDUCED PARKINSONISM IN BALB/C MICE K.O. Adeniran, P.F. Folarin, B.S. Surajudeen, P.S. Ogunkunle, A.O. Olonade and R.O. Folarin
12.50-13.00	**Closing remarks**	
END OF TECHNICAL AND SCIENTIFIC PROGRAMME		
13.00 -14.00	**LUNCH** **Venue:** Barney's Restaurant	

19.00	**GALA DINNER & AWARDS CEREMONY** Venue: Oppenheimer Exhibition Hall (Oppenheimer Conference Room 1) **Dress Code: Formal / Traditional** **Sponsored by** **Angstrom Scientific / JEOL**

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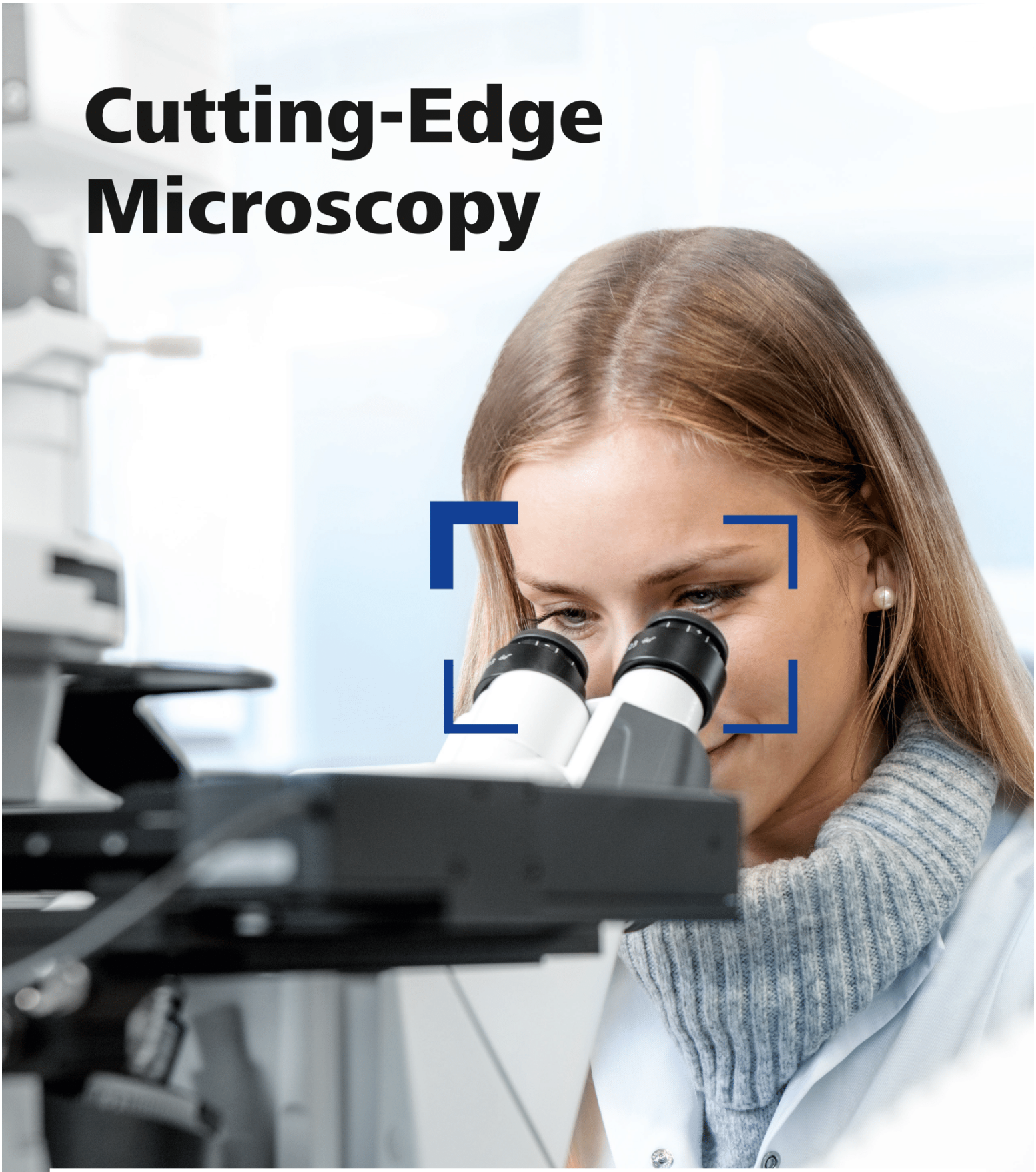

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