CT Scanner
CAF Central Analytical Facilities
STELLENBOSCH UNIVERSITY

CT News Issue 5

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Volume 1, Number 5

In This Issue

Recent interesting scans (clickable links)

Large concrete core with cracks
http://blogs.sun.ac.za/ctscanner/2013/10/01/concrete-cracking/

Matchstick x-ray and CT scan
http://blogs.sun.ac.za/ctscanner/2013/10/01/analyzing-a-matchstick/

Quality inspections for dental wax/glue
http://blogs.sun.ac.za/ctscanner/2013/10/01/quality-inspections-for-dental-wax/

Concrete blocks porosity
http://blogs.sun.ac.za/ctscanner/2013/09/30/porosity-of-concrete-blocks/

Contact Us

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Find us on "Science Exchange" (satisfied customers, please endorse us!):
https://www.scienceexchange.com/facilities/ct-scanner-at-central-analytical-facilities

Welcome

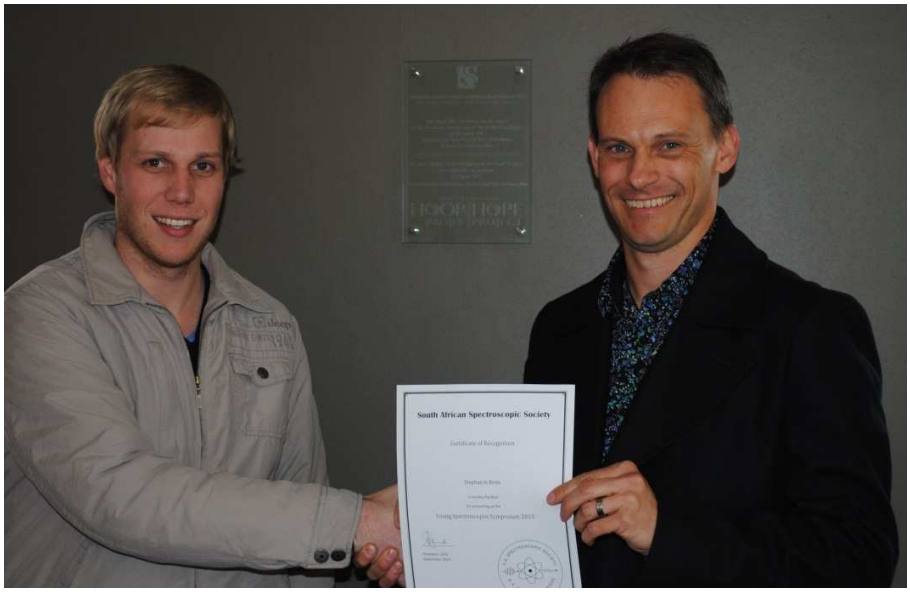
This is the 5th edition of the Stellenbosch CT scanner email newsletter of 2013. The aim of this newsletter is to remind you of the CT scans you wanted to do, or to remind you of telling someone about our facility. More info such as previous newsletters and many more examples can be found at **www.sun.ac.za/ctcanner**.

People & Events

A couple of exciting events took place in the last 2 months. A Bruker micro and nano CT workshop was held at our facility in August, which was well supported by local users. In September an FEI / Avizo Fire Visualization training was hosted with sessions in life sciences, engineering and geosciences.

A Stellenbosch delegation also attended and presented at the first national conference on "Imaging with radiation" at NECSA, near Pretoria. The conference was a huge success with 72 delegates attending. The next conference in this series will be held in Stellenbosch in 2015, so watch this space!

The South African Spectroscopic Society hosted a student conference recently, where our NRF intern Mr Stephan le Roux received the prize for best presentation in the regional section.



Stephan le Roux, NRF intern at the Stellenbosch CT scanner facility, won the regional prize at the South African Spectroscopic Society (SASS) conference. Here he receives his certificate from Dr Johann Fischer, representing SASS.

Application of the month:
Particle size distribution

The combination of high quality, high resolution microCT scans with advanced image analysis can allow particle size distributions to be determined. In this example, crushed chromite ore particles where scanned at 2 microns, and the particle size distribution of the denser phase quantified.

Figure 1 shows a CT slice image demonstrating the good contrast obtained (above), a 3D view (middle) and the histogram of particle sizes (below). Each individual particle has a volume, surface area, location and other data is also available. The 3D image is colour-coded based on particle size, with the largest particles in pink, then orange and so on. This kind of analysis service can be very useful for the analysis of metal particles used in manufacturing and in mechanical engineering applications or for crushed rock or mineral sands in the mining sector.

The same process can be used for porosity analysis of materials, in order to produce a void size distribution. This analysis was done with Avizo Fire software which is now available at our facility. For more information see http://www.vsg3d.com/avizo/fire

This high resolution (2 µm voxel size) was achieved by a combination of special conditions and precautions taken in the scanning process. The result is well worth the extra effort and cost.

Images courtesy of Dr J Miller & Mitch Jardine

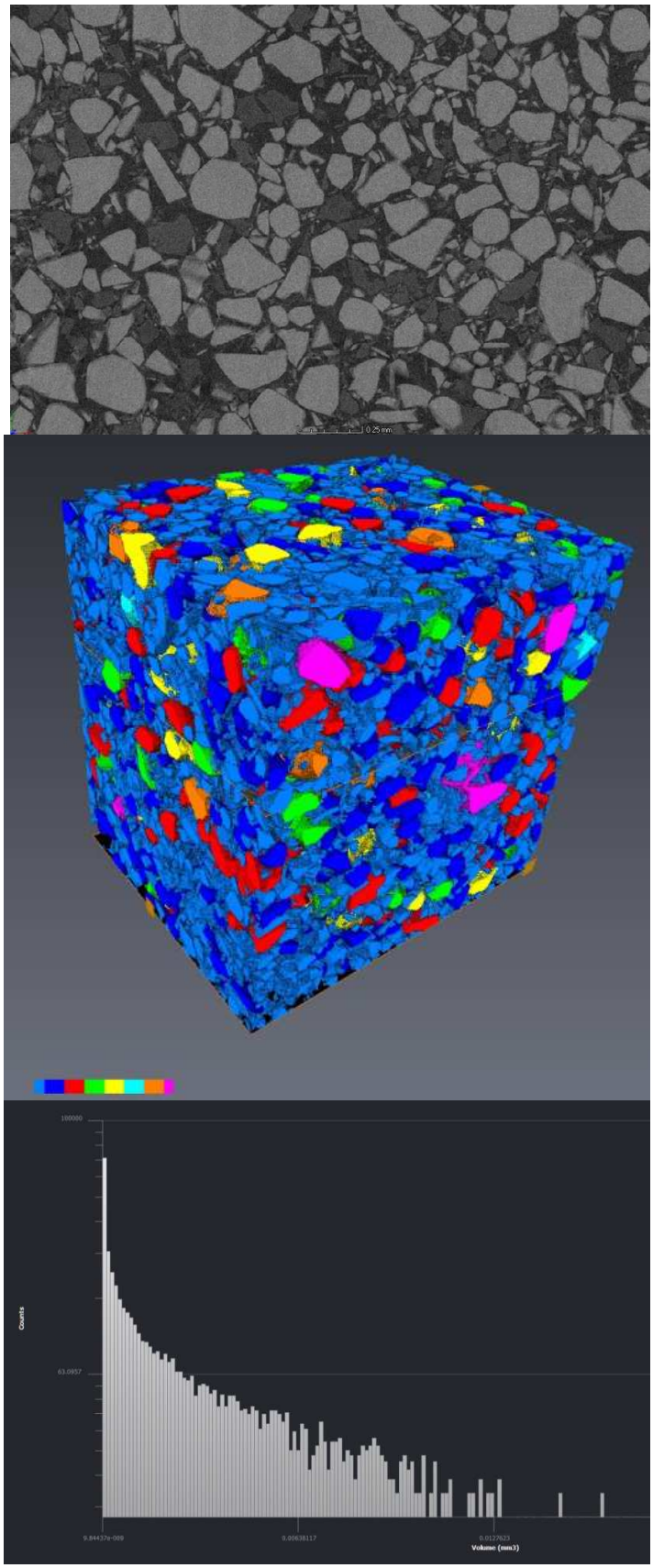


Figure 1: (top left) slice image of crushed ore particles and (top right) 3D view of particles with size colour coding, and the resulting particle size distribution histogram (bottom).

Publication highlight: Combining microCT with Laser Ablation

This project combined X-ray microCT scans with automated laser ablation to allow semi-automated removal of rock from around a fossil. This first proof of concept on a simple example holds promise for the technique to become a standard tool, speeding up the rate of new discoveries in paleontology. We are currently looking for partners to take this technology one step further, please contact us if you have funding.

See also:

http://www.sciencedirect.com/science/article/pii/S0305440313002744

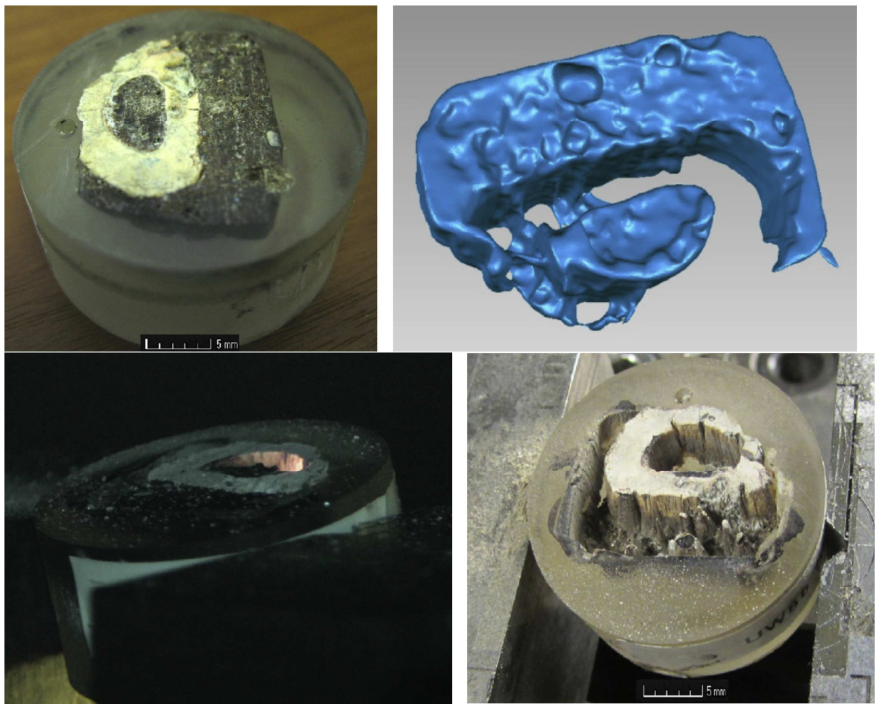


Figure 2: Small fossil bone embedded in rock (top left), CT scan model of rock (top right), laser processing in action (bottom left) and final product after laser ablation of rock from 3D data (bottom right).

Special offers

Student once-off scan offer: finish off your project with a CT scan – we make great 3D images, movies (for your presentation) and even volume measurements. Special "once-off sample" offer: R2000. This includes enough measurements, images and movies to impress your supervisor and your examiners, guaranteed.

Data backup: we now also offer to backup your data at a cost of R50 per 100 Gb per month or R200 per year, added to your CT account.

Please support our collaborating partner – see advertisement in the next pages – more information at http://www.zeiss.com/xrm
Local contact / representative: Veno.naidoo@zeiss.com

New service: Fast-track your research

In an effort to simplify the usage of the CT scanner facility for researchers who wish to publish their work fast, we now offer full research projects, all inclusive of scans, analyses, interpretation, re-scans and reporting. Depending on the scope of the project, a full project can be completed within less than 1 month. The quoted full project cost is fixed and this is irrespective of the number of scans required or the amount of method development that needs to be done, and includes any rescans possibly required in the publication process (that reviewer #3!). We can only take on one such project per month, but this is an ideal way to start off a new project and give your students a running start.

Acknowledgements

The CT scanner equipment acquisition was made possible with grants from the National Research Foundation and Stellenbosch University. The Department of Science and Technology Internship program is also acknowledged for its support of this facility. We encourage and welcome any form of sponsorship or support in order to keep delivering the best quality.

Press Release

ZEISS is shaping the future of microscopy by acquiring Xradia

X-ray microscopy solutions close the gap between light and electron microscopy

Jena/GERMANY and Pleasanton, CA/USA, July 18, 2013—ZEISS, the international leader in the fields of optics and optoelectronics announced today that the acquisition of US-based Xradia, Inc. has been completed. The closing took place on July 12, 2013 after all formal conditions, as set in the Acquisition Agreement, were fulfilled. Xradia, Inc. is now operating under the new name of Carl Zeiss X-ray Microscopy, Inc. This acquisition further strengthens the position of the ZEISS Microscopy business group, the only manufacturer of light, electron and X-ray microscopes, with unique solutions for research and routine inspection in materials and life sciences application fields.

1 ZEISS Xradia Versa, Ultra and Synchro systems bridge the multi-lengthscale resolution gap for 3D microscopy

X-ray microscopes show unique capabilities in materials research, allowing for 3D imaging of the internal structure of materials. Spatial resolution down to 50 nanometers can be achieved on a laboratory-based system. The non-destructive nature of X-ray imaging enables the observation and quantification of microstructural evolution in the same region of a single sample over time, or under changing environmental conditions. Several examples of *in situ* and 4D (three-dimensional imaging over time) experiments are proving beneficial for research and industry, including crack propagation in ceramics and metals, porosity and permeability characterization of geological and functional materials, failure analysis of structural materials, biomechanical systems under load, and the evolution of defects in operating lithium ion batteries and fuel cells.

X-ray microscopes close the resolution gap between light and electron microscopy and offer scientists multiple new imaging modalities to complement their research. The unique optical design allows the ZEISS Xradia Ultra and Versa series to cover a large resolution range, enabling the user to easily find the region of interest by zooming into larger samples (Scout-and-Zoom). ZEISS is working towards integrated workflow solutions for life sciences and materials research. In materials science, this is typically achieved by using X-ray microscopes to perform non-destructive 4D microstructural evolution experiments prior to destructive sectioning and then using electron microscope techniques for additional resolution and contrast. In life sciences, X-ray microscopes are being used to provide a navigational map of the subsurface after tissue

samples have been stained for electron microscope investigation. By incorporating 3D X-ray microscopes into this workflow, the emerging 3D electron microscope techniques will gain a significant boost in efficiency.

While maintaining close customer relationships and continuing with current projects, ZEISS is leveraging its vast sales force to make the X-ray technology more accessible in a broader range of applications and workflows. Customers will also benefit from direct service capabilities at multiple locations globally.

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About ZEISS

The Carl Zeiss Group is an international leader in the fields of optics and optoelectronics. In fiscal year 2011/12 the company's approximately 24,000 employees generated revenue of nearly 4.2 billion euros. In the markets for Industrial Solutions, Research Solutions, Medical Technology and Consumer Optics, ZEISS has contributed to technological progress for more than 160 years and enhances the quality of life of many people around the globe. The Carl Zeiss Group develops and produces planetariums, eyeglass lenses, camera and cine lenses and binoculars as well as solutions for biomedical research, medical technology and the semiconductor, automotive and mechanical engineering industries. ZEISS is present in over 40 countries around the globe with about 40 production facilities, over 50 sales and service locations and service locations and approximately 20 research and development sites. Carl Zeiss AG is fully owned by the Carl Zeiss Stiftung (Carl Zeiss Foundation). Founded in 1846 in Jena, the company is headquartered in Oberkochen, Germany.

About Carl Zeiss Microscopy

The Microscopy business group at ZEISS is the world's only manufacturer of light, X-ray and electron microscopes. The company's extensive portfolio enables research and routine applications in the life and materials sciences. The product range includes light and laser scanning microscopes, X-ray microscopes, electron and ion microscopes and spectrometer modules. Users are supported for software for system control, image capture and editing. The Microscopy business group has sales companies in 33 countries. Application and service specialists support customers around the globe in demo centers and on site. The business group is headquartered in Jena, Germany. Additional production and development sites are in Oberkochen, Göttingen and Munich, as well as in Cambridge in the UK and Peabody, MA and Pleasanton, CA in the USA. The company has around 2,800 employees and generates revenue of 650 million euros.

www.zeiss.de/press

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