BRUKER MICRO-CT ACADEMY

Bruker microCT
Kartuizersweg 3B
B-2550 Kontich, Belgium
Tel: +32 (0)3 877 5705
Fax: +32 (0)3 877 5769
applications.BmCT@bruker.com
www.bruker-microCT.com

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● Welcome

Last week we held our annual microCT User Meeting in Mondorf Thermal Domain, Luxembourg. We sincerely thank all the authors for submitting their scientific abstracts and hope to meet again next year!

This month's issue will focus on how we can visualize and analyze osteocytes and blood vessels inside cortical bone.

● Osteocyte and vessel visualization

The Osteocytes are the most commonly found cells in mature bone tissue. They have a stellate shape and are approximately 7 micrometers in diameter by 15 micrometers in length. In mature bone, osteocytes and their processes reside inside spaces called lacunae or pits and canaliculi, respectively. Although osteocytes have reduced synthetic activity, they are actively involved in the routine turnover of bone matrix, through various mechanosensory mechanisms. They destroy bone through a rapid, transient (relative to osteoclasts) mechanism called osteocytic osteolysis. Blood vessels on the other hand are responsible for oxygen and nutrient delivery and waste removal, via the circulating blood. Vascular pores are relatively large and can be picked up even with medium-resolution scans. However, detecting osteocyte lacunae requires much higher resolution. Fortunately, current microCT systems allow scanning bone at sub-micron resolution allowing 3D characterization of intracortical vascular porosity and osteocyte lacunae.

Method note "*MN058_Visualisation and analysis of the osteocyte lacunae and blood vessel network in cortical bone*" will explain step by step how to separate, analyze and make 3D models of the osteocyte lacunae and the blood vessel network inside the cortical bone automatically. The discrimination between the large
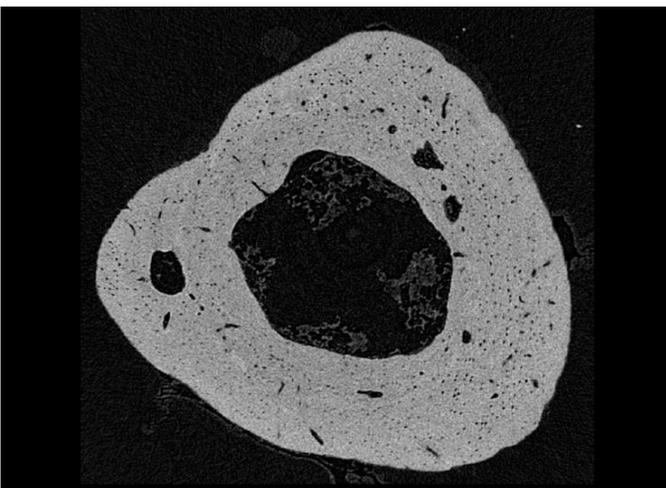
Left: Reconstructed cross-section through the mouse tibia diaphysis showing the small osteocyte lacunae and the larger vascular pores (black) inside the mineralized cortical bone matrix (grey).
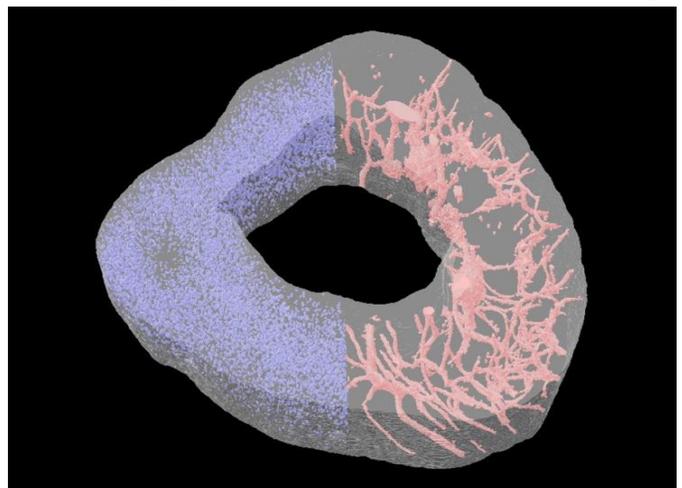
Right: Surface rendered 3D models of the cortical mid-section of a mouse tibia, the vascular network and the osteocyte lacunae. The mineralised bone matrix is set grey transparant, the vascular pore network red and the osteocyte lacunae blue. For easier interpretation, the models for the vascular pore network and osteocyte lacunae were cut along the vertical axis and displayed separately.

Innovation with Integrity

vascular pores and small osteocyte lacunae can be done based on size. However, the principle of this analysis task list is based on open versus closed porosity. Osteocytes are completely embedded in the mineralized bone matrix and can thus be considered closed pores. Vascular pores on the other hand can be considered open pores as blood vessels run through the cortical bone and exit the bone at some point. A similar approach can be applied to several other samples or objects when making separate surface rendered 3D models of the open and closed pore network, including geological drill cores as discussed in a previous edition of the Bruker microCT Academy 2014 issue 4.
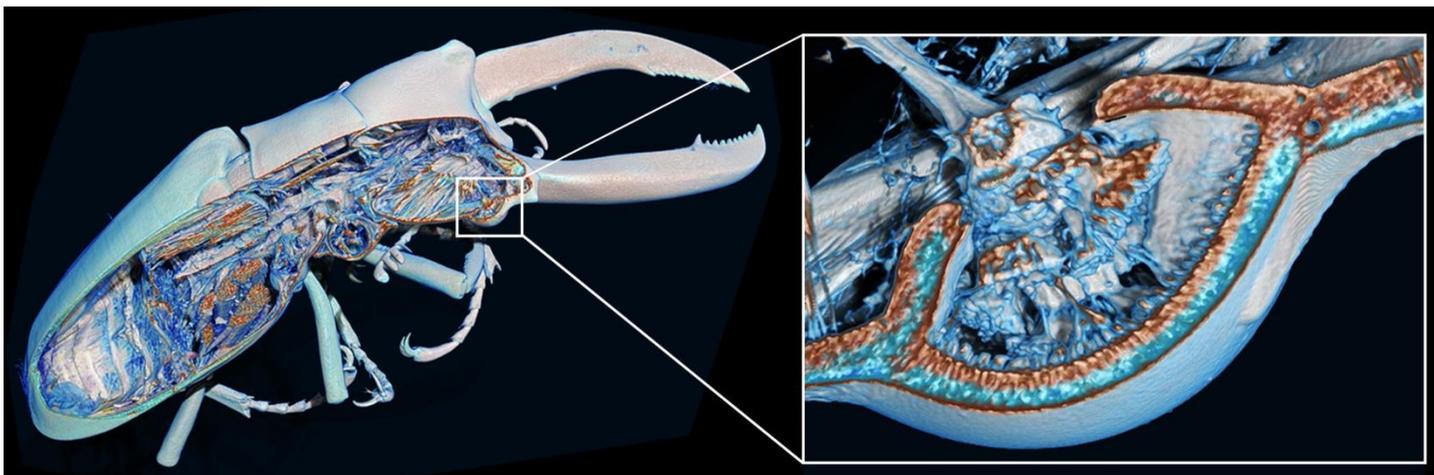
- **Upcoming events**

Bruker microCT will participate with an exhibit in the forthcoming conferences. Please click the link below for more information. We hope to see you there!

- IADR   Jun. 22 – 25   Seoul, South Korea
- SPWLA   Jun. 25 – 29   Reykjavik, Iceland
- XRM   Aug. 15 – 19   Oxford, UK
- ICXRI   Aug. 17 – 18   Putra Jaya, Malaysia
- IGC   Aug. 27 – Sep. 04 Cape Town, South Africa
- JASIS   Sep. 06 – 09   Chiba, Japan
- WMIC   Sep. 07 – 10   New York, USA

- **Bruker microCT News**

With over 100 attendees participating from 21 different countries, and more than 60 scientific contributions, this year's microCT User Meeting turned out to be a great success again. We sincerely thank all the authors for submitting their scientific abstracts! Follow our website closely! The presentations and the group photo will be on-line soon!

Winners of the year:

- Best oral presentation: Ruslan Hlushchuk, University of Bern, Switzerland: "*MicroangioCT: from eye to kidney and bone*"

- Best poster: Bartosz Leszczyński, Jagiellonian University, Poland: "*The eye anatomy visualization using micro-CT*"

- Best movie: Gerard van Dalen, Unilever R&D, The Netherlands: "*Orange dry microCT*"

- Best picture: Javier Alba-Tercedor, University of Granada, Spain: "*Who inspired who? A dung beetle (Scarabaeus) versus Obelix*"

We hope to welcome you once again next year.

- **Image of the Month**

Volume rendered 3D image of the internal structure of a male stag beetle of the Cyclommatus metallifer species (collaboration with Dr. Jana Goyens, Laboratory of Functional Morphology, University of Antwerp, Belgium). The high magnification inset represents a virtual cut through the eye. The scans were done with the SkyScan 1272.