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Developments in X-Ray Tomography VII

Stuart R. Stock
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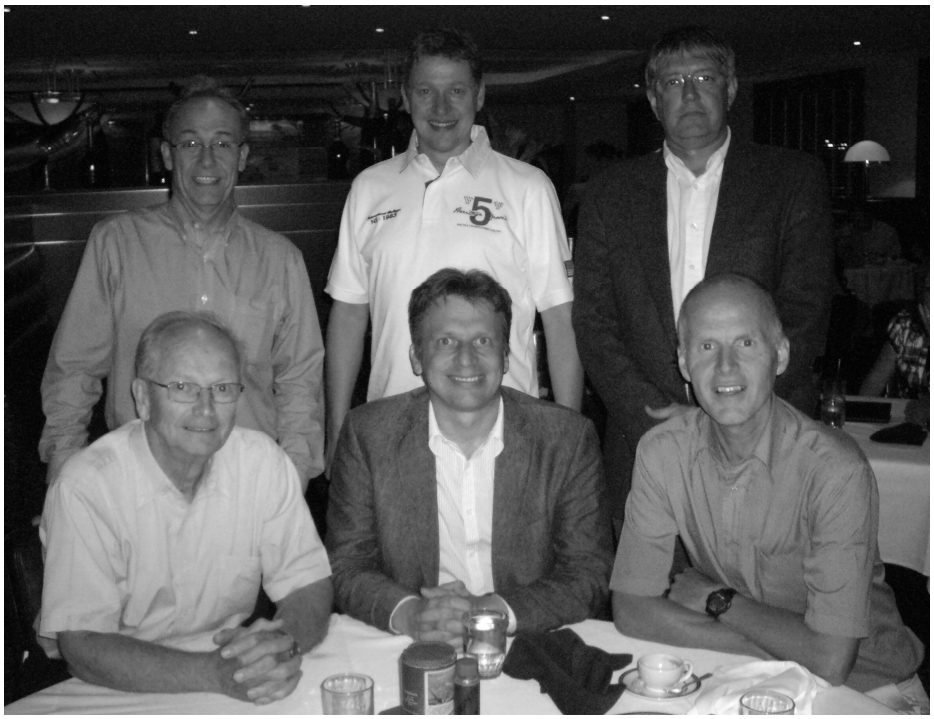
Introduction

The seventh conference in this series was marked by a slight change in format with Wednesday afternoon consisting of a plenary session joint between the various x-ray, gamma-ray and particle technology conferences. These four talks included one titled "4D X-ray Characterization of Metal Structures" by Dorte Juul Jensen of Risø National Laboratory (Denmark). This approach reconstructs polycrystalline specimens in a different fashion from most studies in this volume.

The diversity of applications underlined the mature interdisciplinary scope of the conference. Established groups continued the trend of more detailed and sophisticated analyses than in previous meeting, and new contributors (both early career and senior investigators) brought fresh ideas to the meeting. Papers describing advances in instrumentation and in reconstruction algorithms were met with great enthusiasm by the attendees.

I would like to thank the authors for their excellent contributions and the program committee for their very important help. Last, but not least, the SPIE staff provided exemplary support with the program development, the meeting itself and the proceedings.

Stuart R. Stock



The program committee after their mid-conference planning meeting. From the left, bottom row: Erik Ritman, Bert Müller, Graham Davis; top row: Mark Rivers, Felix Beckmann, Stuart Stock.

Members not in the group photo:
Ge Wang (top), Steve Wilkins (bottom).

Competition: Most Artistic Tomography-based Image

S. R. Stock[1], et al.
Department of Molecular Pharmacology and Biological Chemistry, Feinberg School of Medicine, Northwestern University, 303 E. Chicago Ave., Chicago, IL USA

ABSTRACT

Each image submitted for the competition is presented briefly. Images derived from tomography data and from the studies presented in Developments in X-ray Tomography VII are eligible. The sole criterion for the contest is artistic impression. One image per presentation (oral or poster) will be accepted in the format of a powerpoint slide. No animations allowed. Information on the image (title, authors and their affiliations) should follow on a second slide. Each image will be posted at the poster session and again in an oral session; winners will be announced during the oral sessions on the day following the second presentation.

Keywords: Tomography, artistic, image, x-ray

The first "Most Artistic Tomography-based Image" competition contained ten entries. The rules were: One submission was allowed per abstract presented at the Conference for which this is the proceedings. Each submission must be an x-ray tomography-based image (radiograph, slice, 3D rendering, sonogram. no animation). Each submission must not have been published previously.

The ten entries were displayed first at the poster session, Monday evening before the oral sessions began on Tuesday. The entries were again presented at the end of Tuesday's oral sessions. All of the entries (descriptions and author information first; image second) follow below (grayscale in the hard copy and color in the on-line versions of the proceedings). Immediately following the second presentation, the assembled attendees voted. The winners were announced at the end of the oral presentations on Wednesday. Three images were the attendees' favorites; these appear first and are labeled with ribbons. It is interesting that all entries received significant support, demonstrating the range of artistic preferences of the voters and entrants. The ordering among the winners and among the other entries is random.

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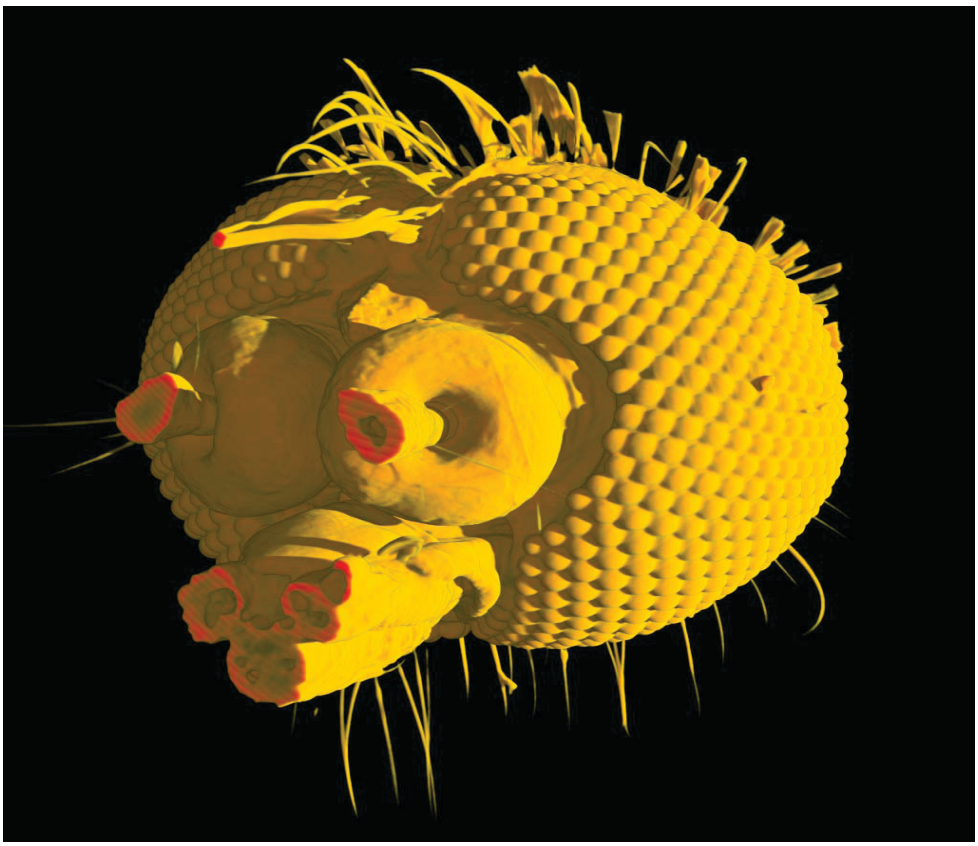
Mosquito

A. Rack*, T. Weitkamp*, A. Cecilia^, D. Wegrzynek", E. Chinea-Cano",
P. Wobrauschek~, Ch. Streli~

*European Synchrotron Radiation Facility, Grenoble, France
^Karlsruhe Institute of Technology – ANKA, Karlsruhe, Germany
"International Atomic Energy Agency, Vienna, Austria
~Technische Universität Wien, Vienna, Austria

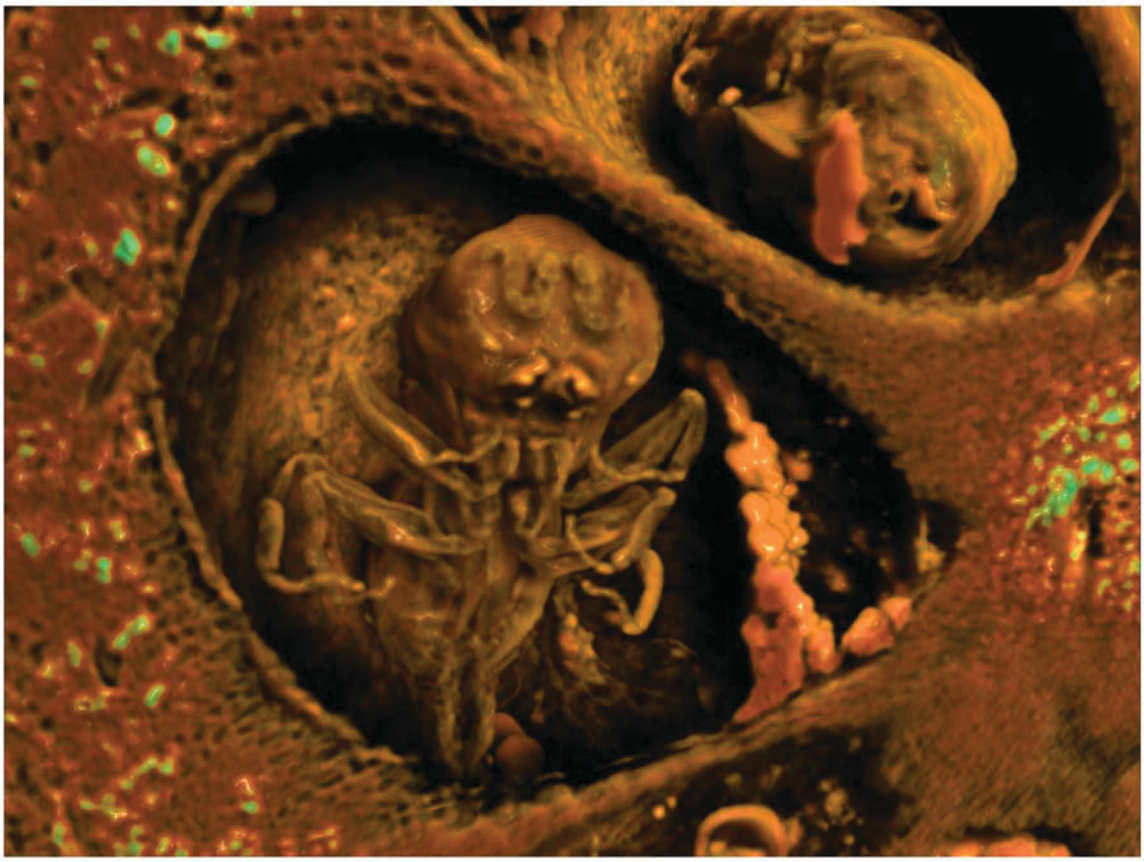
Volume rendering showing the head of a malaria transmitting mosquito (genus *Anopheles*). Phase-sensitive microtomography recorded at the TopoTomo beamline of the ANKA light source (Germany) with a filtered white beam. Phase-retrieval performed *via* the ANKAphase software.



The one that didn't get away!

Graham R Davis and David Mills
Queen Mary University of London

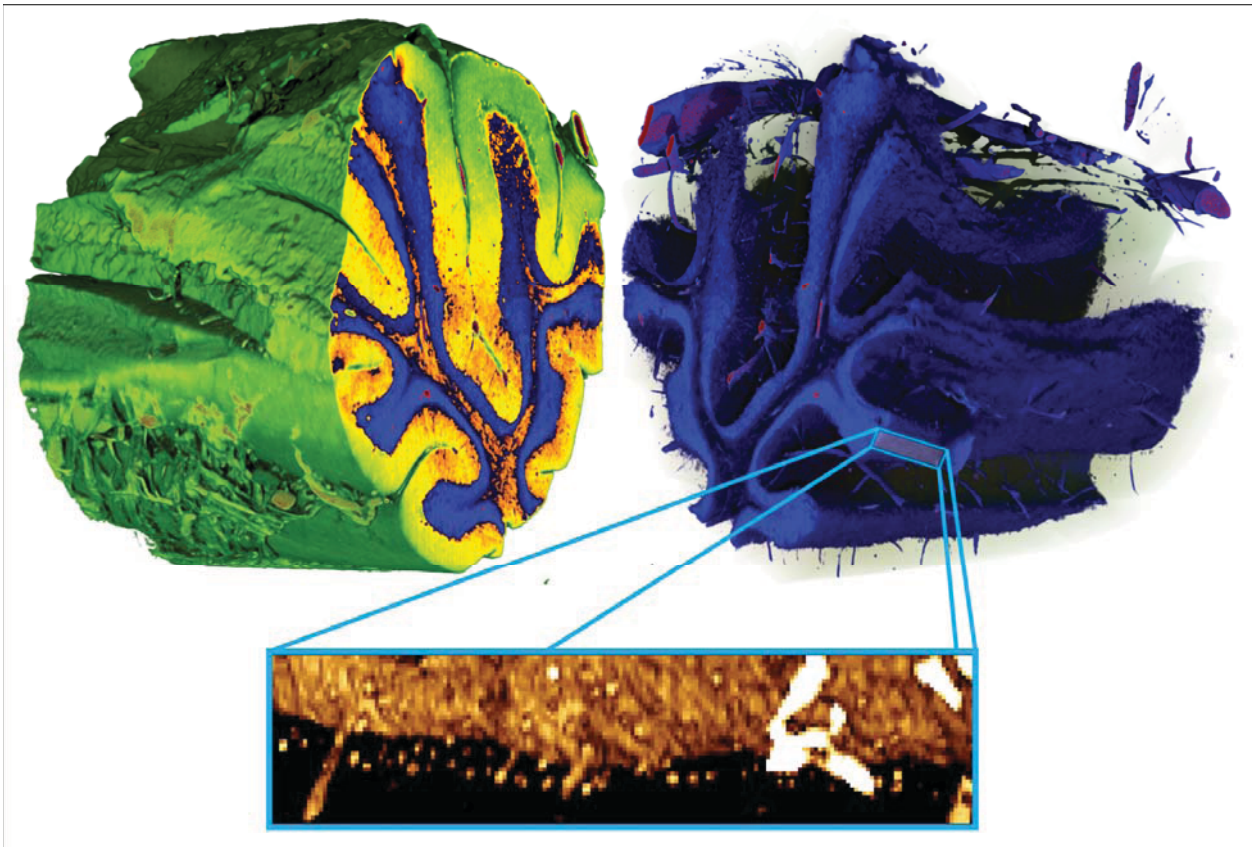
A partially developed gall wasp inside an intact oak gall; scanned on the MuCat 2 scanner and rendered with Drishti.



Grating interferometry of a human cerebellum

Georg Schulz*
*Biomaterials Science Center,
University of Basel, Basel, Switzerland

The 3D rendering shows grating based phase contrast results of a part of a human cerebellum measured at ID19, ESRF, France. Beside the blood vessels one can differentiate between white (orange) and grey matter which can be divided into stratum moleculare (blue) and stratum granulosum (yellow, green). Furthermore, the golden image below shows a 3D visualization of individual Purkinje cells what was arranged without the application of any staining agents.



DROSOPHILA MELANOGASTER

Luca Poletto
National Council for Research - Institute for Photonics and Nanotechnologies, Padova, Italy

Tomography of a Drosophila Melanogaster: external view.
Recorded with a tube-based microCT system, 25 kV, 800 projections, 10 μm resolving element.

Bone

K. M Hannah[1,2], C. D. Thomas[3], J. G. Clement[3], F. De Carlo[4], A. G. Peele[1,2]

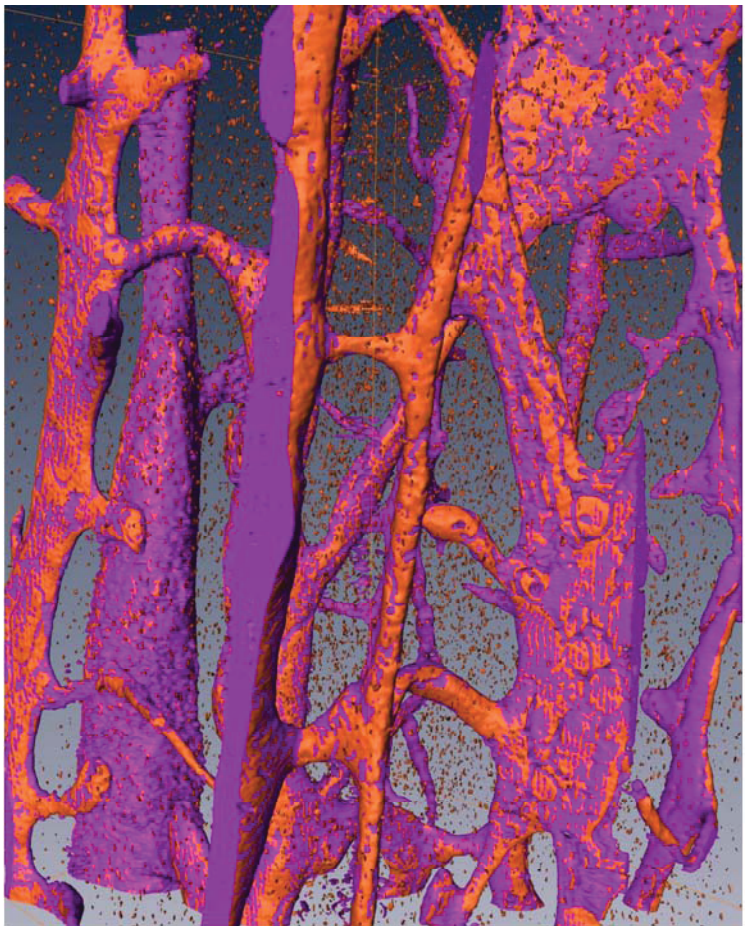
1. Australian Research Council Centre of Excellence for Coherent X-ray Science
2. Department of Physics, La Trobe University, Victoria 3086, Australia
3. *Melbourne Dental School, The University of Melbourne, Victoria 3010, Australia*
4. *Advanced Photon Source, Argonne National Laboratory, Argonne, Illinois 60439, USA*

Description

A 3D rendered image of a section of human femur. Visible are the Haversian canals (large features) and surrounding osteocyte lacunae (small features). Data obtained at 2BM, Advanced Photon Source, Image created using Amira V4.1.

Acknowledgements

The authors acknowledge the support of the Australian Research Council through the Centre of Excellence for Coherent X-ray Science, The authors also acknowledge the Australian Synchrotron Research Program, which is funded by the Commonwealth of Australia under the Major National Research Facilities Program. Use of the Advanced Photon Source was supported by the U.S. DOE, Basic Energy Sciences, Office of Science under Contract No. W-31-109-Eng-38. We are grateful to the mortuary staff and the staff of the Donor Tissue Bank of the Victorian Institute of Forensic Medicine for their assistance in the collection of the series of bone specimens from which this sample was taken, and particularly grateful to the next-of-kin of the donor for permission to remove bone for research purposes.

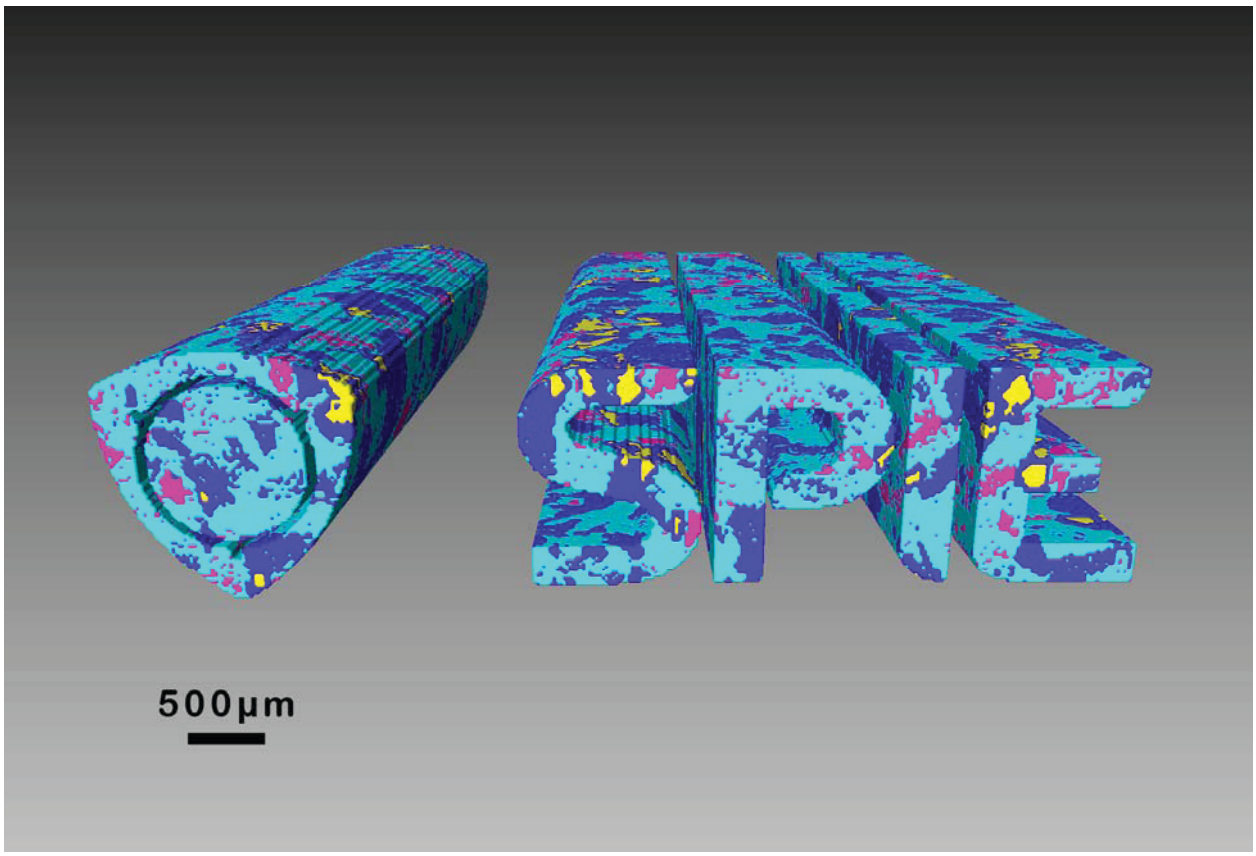


spierock

D.M. Stevenson*

*Beckman Institute for Advanced Science & Technology,
University of Illinois at Urbana-Champaign, USA

Three dimensional surface rendering from segmented x-ray tomography data of igneous rock, obtained on tube-based microCT system. The SPIE logo was used as a volume mask across the entire dataset to create the final surface. The four colorized portions in the masked sample correspond to the four distinct mineral phases within the rock: Pyrite, Plagioclase, Pyroxene + Olivine, and void space (porosity).

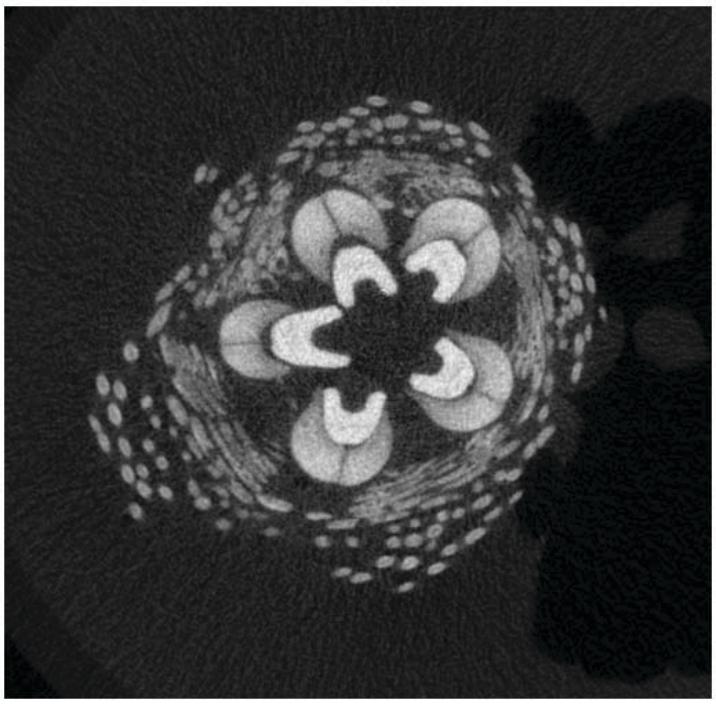


Fivefold

S.R. Stock*

*Feinberg School of Medicine, Northwestern University, Chicago, IL, USA

Slice showing the body plates and oral region including teeth of the sea urchin *Eucidaris tribuloides*. Recorded with a tube-based microCT system.

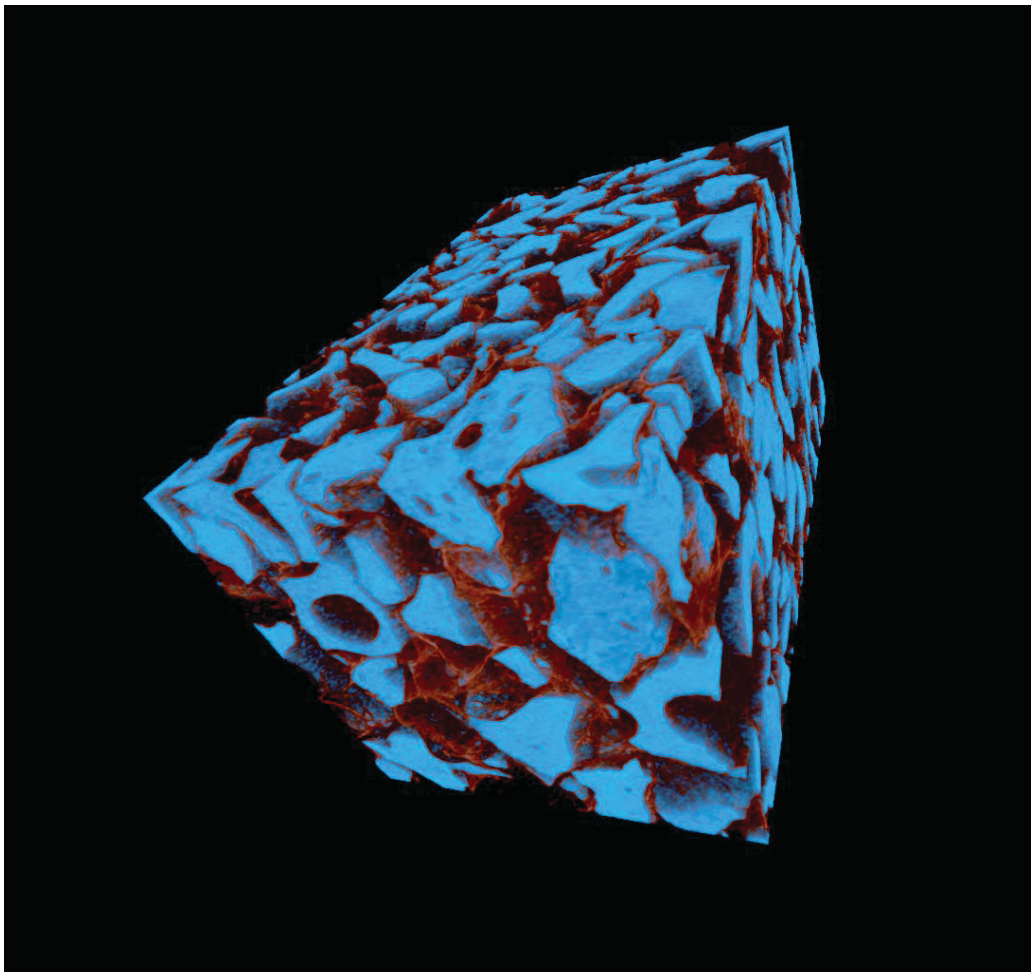


xx

embedded

Sebastian Friess* and Michael Bufler
*Gloor Instruments AG, Switzerland

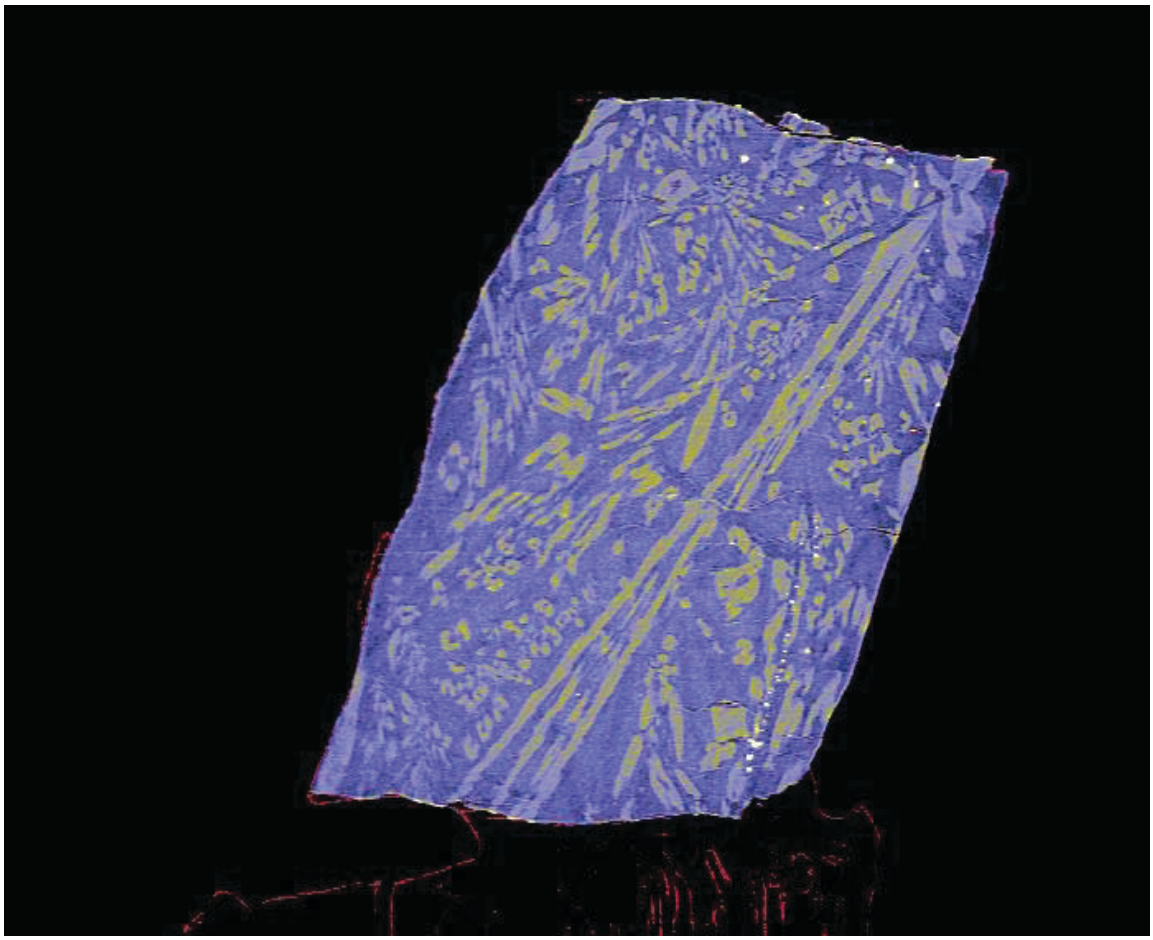
bone shreds embedded in a highly interconnective network of a biological matrix. scanned on a tube-based commercial highresolution microCT system



liquidus quenched

Mark L. Rivers
University of Chicago, Chicago, IL, USA

A piece of glass was synthesized at high-pressure and high-temperature. It was cooled below the liquidus, so crystals began to grow, and then it was quenched. The sample is about 3mm in size.



Sandstone microstructure cake

Sherry Mayo & Sam Yang
CSIRO Materials Science & Engineering Division
Private Bag 33, Clayton, Victoria 3169, Australia

3D view of a data-constrained modelling reconstructed microstructure of a sandstone sample consists of quartz and calcite. The construction was based on X-ray CT images taken at 35 and 45 keVs respectively.