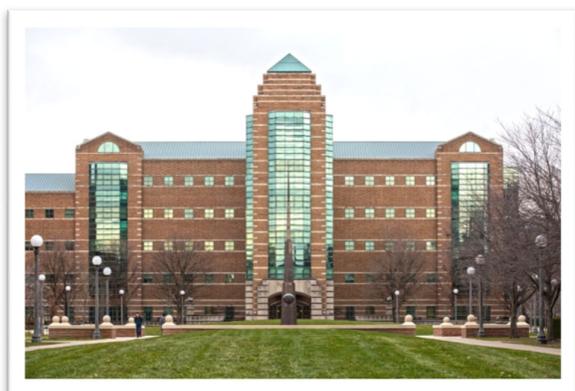




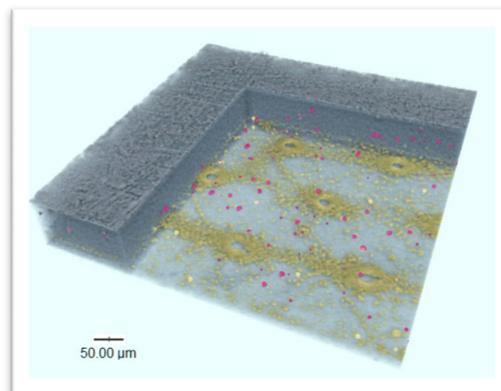
X-ray Microscopy Seminar and Workshop

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Reported by Aya Takase, Senior Scientist at Rigaku Americas Corporation

X-ray computed tomography (CT) is well known as a diagnostic technique in the medical arena or as a non-destructive inspection technique for luggage and various mechanical parts. X-ray source and detector technologies, along with data processing techniques, have advanced rapidly in recent years, making X-ray CT a great imaging technique for Materials and Life Science. Since the technique is relatively new to those fields it is still very much under-recognized. As a leading X-ray company, we started an X-ray CT outreach to Materials and Life Science researchers last year. We held a seminar and workshop at the University of Southern California Medical Imaging Center in 2018. This year, we held an X-ray Microscopy Seminar and Workshop hosted by The Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign.



Beckman Institute



*3 μm thick organic membrane filter
imaged by Rigaku nano3DX*

The Imaging Technology Group (ITG) at the Beckman Institute serves dozens of research groups and hundreds of researchers from the Institute and nearly every department on campus, providing state-of-the-art microscopy/spectroscopy and image processing/rendering through its Microscopy Suite. They have a dedicated laboratory for X-ray CT, so this was the perfect place to hold the seminar. We invited accomplished speakers who use X-ray microscopy in various research fields. Dr. Mariana Kersh, an Assistant Professor in the Department of Mechanical Science and Engineering at The University of Illinois at Urbana-Champaign and Director of the Tissue Biomechanics Laboratory, showed us how her team uses X-ray CT to evaluate mechanical and structural properties of bone, studies what is different between healthy and unhealthy bones, and recommends what we can do to keep our bones healthy. Joseph Neilly, Principal Research Scientist at AbbVie, presented how they use X-ray CT to analyze %crystallinity of active ingredients in extruded tablets, how X-ray CT not only provides %crystallinity but also three-dimensionally images where the crystallites are in the tablet, and how this helps us understand where the unwanted crystallization starts. Dr. Jonathan Dusting, Director of Innovation at 4Dx, presented their patented four-dimensional lung function imaging analysis that can visualize air flow in breathing lungs and uniquely and non-invasively measures lung function in real-time. Their technology provides unprecedented insight into pulmonary function, which is critical in the analysis and management of respiratory diseases.

Rigaku offers three X-ray CT scanners, the nano3DX for 700 nm resolution high-contrast microscopy, the CT Lab HX to cover a wide range of microtomography needs from 2.2 μm voxel resolution to 200 mm field of view, and the CT Lab GX for stationary sample mount and high-speed scans for in-situ measurements and in-vivo scans. The Imaging Suite at Beckman Institute houses the nano3DX and the CT Lab GX to offer a wide range of X-ray CT imaging services.



*Rigaku X-ray microscope and microtomography systems
(from left to right: nano3DX, CT Lab HX, and CT Lab GX)*

After enjoying the invited speakers' talks in the morning, we moved to the X-ray CT lab in the Imaging Suite to see instruments and run CT scans. We had fun grabbing random objects that interested us and scanning them, starting with a TV remote control to discover it was almost an empty shell with minimal electronics, a candy bar to count how many peanuts were actually in it, to a piece of bamboo to see individual sieve tubes, water vessels, and vascular bundles making up the beautiful pattern of bamboo structure.



Lab workshop

Speakers and attendees had great discussions about the different kinds of research fields we were in and we all learned something new from each other. We would like to thank all the invited speakers and attendees, especially the out-towners, who came to the seminar to join

us. We are extremely grateful to Dr. Leilei Yin who helped us organize the seminar and was kind enough to let us have fun in his lab.

In collaboration with ICDD (the International Centre for Diffraction Data), we will be organizing an X-ray CT Workshop at the Denver X-ray Conference in Lombard, IL on August 5th. We will have another seminar at our Rigaku facility in The Woodlands, TX, on October 30th, then we will go to University of Delaware next year. Stay in touch. We might be in your town next!