INTERVIEW WITH DR. HIROMITSU FURUKAWA

The interview was conducted as a part of discussions on organizing a workshop on three-dimensional imaging at the National Institute for Nanotechnology in the spring of 2008. Stay tuned for the updates!

Dr. Hiromitsu Furukawa developed the electron tomography package for JEOL transmission electron microscopes (TEMs). His company recently introduced a MATLAB scripting package for JEOL TEMs. More information on Dr. Furukawa can be found at www.temography.com.

Marek Malac (MM): Many microscopists had a chance to see your workshop at the Microscopical Society of Canada/Société de Microscopie du Canada (MSC/SMC) meeting in Edmonton in 2007. How did you like the meeting and what made you consider organizing such highly specialized workshop at a MSC/SMC meeting?

Hiromitsu Furukawa (HF): I thought that the workshop at MSC2007 was very exciting and worthwhile. Recently, a lot of researchers are paying attention to the tomography technique. So, such a workshop is inevitable. I admire the keen eye of the MSC/SMC organizers.

(MM): What lead you to become interested in TEM tomography? How long were you working on electron tomography before the first TEMography package was released?

(HF): In 1999 I obtained the budget from the Japanese Government and developed special hardware for high-speed operation. Furthermore, I was interested in computer tomography as an application that would prove the performance of the hardware. At once, I noticed that this technique is effective to TEM. Right after that I jumped onto developing applications for TEM. As you can see, TEMography was released in 2004.

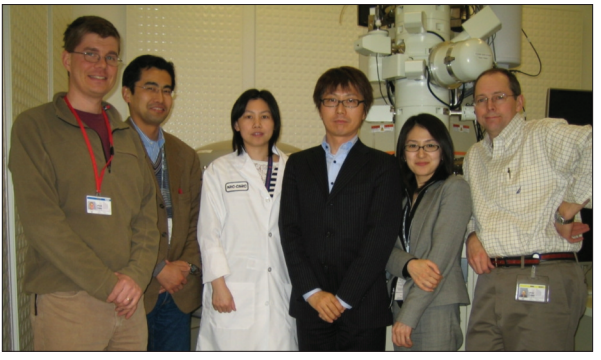
(MM): Which applications do you see benefiting from electron tomography most strongly?

(HF): The application range of TEMography is very wide. Actually, a lot of users are using TEMography regardless of their field of application, whether biological or materials science. I am presently especially interested in looking at polymers and proteins in 3D.

(MM): What do you see as fundamental limits of electron tomography besides radiation damage?

(HF): The penetrating ability of the electron beam through samples is lower than that of X-rays. This is the most fundamental limit. Therefore, the limitation is caused by the thickness of the sample and the angle of tilting.

(MM): Which parameters or microscope setup aspects are most critical for successful electron tomography?



TEMography installation at NINT in the spring of 2007.
From left: Marek Malac, Masa Kawasaki, Julie Qian, Hiromitsu Furukawa, Mioko Shimizu and Brian Legge. JEOL 2200 FS at NINT in the background. The photo was taken at around 2 a.m.

(HF): The eucentric performance of the TEM specimen stage is very important. A lot of consideration must also be given to specimen preparation if the best 3D information is to obtained.

(MM): Do you anticipate the limits of electron tomography to extend to 3D chemical analysis at atomic resolution in the foreseeable future?

(HF): I know a lot of researchers are requesting this capability. But, I think that it is a problem related to the basic observational principles of TEM.

(MM): The fact that TEM in single-projection experiments is prone to misinterpretation suggests the use of tomography on a regular basis. Do you see electron tomography becoming a routine technique used on regular basis on most TEMs (even if over a limited tilt range) in a way similar to EDX spectroscopy?

(HF): I think that there is a limit to tomography as a TEM technique, too. However, it is expected that the resolution of a 3D reconstructed image should be improved to better match the resolution capabilities of a TEM. I am working within our company with the hardware design people to develop such a dream TEM.

(MM): I found your TEMography reconstruction package very convenient. The rumor is that microscopists with non-JEOL microscopes like to use your reconstruction software package on their data. Would you like to comment on this rumor?

(HF): Thank you. I am glad to hear this rumor. TEMography can readily be used with all the standard data formats (Include dm3, mrc, ...). In addition, the package is now available on our website, www.temography.com.

(MM): You have traveled to many countries to promote and install your products. If you were going to name two places that made the strongest impressions, which ones would you select and why?

(HF): This may be the most difficult question in this interview. The places that I have visited were all impressive and I am very grateful that customers from of all over the world ardently welcome TEMography.

(MM): Your work includes a significant amount of travel. What do you like most about traveling? What do you dislike most about traveling?

(HF): I love traveling and I am very interested in experiencing different cultures and admiring beautiful scenery. However, I cannot go to my office often and so I miss the time to work with my staff.

(MM): What is your favorite object for photography and what is your favorite film camera? Do you prefer using film or digital cameras for your photos?

(HF): It is my great pleasure to take photographs with my classic film cameras when I go to small towns in the world. This makes me feel like a boy, full of imagination and creativity.

(MM): What are your favorite movie and music? What sports do you like?

(HF): I love animation movies. My staff calls me "OTAKAU". I enjoyed skiing, riding a bicycle and motor car racing when I was young. I wish I had enough time for sports but I usually walk about 10 km or sometimes more all day long when I am taking snap shots.