

Carnegie Mellon

Materials Science and Engineering Seminar Series

Materials Research at Carnegie Mellon

Professor Marc De Graef

Department of Materials Science and Engineering
Carnegie Mellon University

“From 2-D Images to 3-D Objects: Recent Progress”

Friday, March 21, 2008

11:30 A.M. Seminar in Baker Hall A51

Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

Nearly all imaging methods in materials science produce two-dimensional (2-D) information. While it is possible to derive 3-D information from such images through stereological considerations, it is often desirable to obtain a full 3-D insight into a particular microstructure. In this talk, we will review recent progress in the area of (1) collecting 2-D data from which 3-D reconstructions can be made, and (2) the conversion process itself, i.e., how one can take 2-D slices or 2-D tomographic projections and turn them into accurate representations of the original object.

We will start from 2-D observations, either slices obtained through serial sectioning by means of focused ion beam microscopy or robotized metallography, or projections obtained by means of x-ray and electron beams. Then we introduce a number of basic processing steps that will allow for the conversion of 2-D slices into a 3-D data stack, using Ni-based superalloys and a fifty year old data set on a pearlite colony as examples.

Next we will consider the basic concepts of tomographic techniques and apply them to data obtained in the Lorentz TEM observation mode for patterned permalloy islands. We will conclude this talk with an overview of the current and future experimental capabilities in the MSE department.

Professor De Graef received his BS and MS degrees in physics from the University of Antwerp (Belgium) in 1983, and his Ph.D. in physics from the Catholic University of Leuven (Belgium) in 1989, with a thesis on copper-based shape memory alloys. He then spent three and a half years as a post-doctoral researcher in the Materials Department at the University of California at Santa Barbara before joining Carnegie Mellon in 1993 as an assistant professor. He is currently professor and co-director of the J. Earle and Mary Roberts Materials Characterization Laboratory. His research interests lie in the area of microstructural characterization of structural intermetallics and magnetic materials.