



Seminar

Novel Indexing Approaches for EBSD: Using the Complete Pattern

 Wednesday April 28, 2021	Prof Marc De Graef Marc De Graef is currently Professor and Director of the J. Earle and Mary Roberts Materials Characterization Facility (MCF), Carnegie Mellon University, USA.
 10:00am (AEST)	
 ZOOM – https://monash.zoom.us/j/844612127 PASSCODE: 111111	

Abstract

Electron back-scatter diffraction (EBSD) has during the past 25 years become an indispensable characterization tool in both materials science and the earth sciences. While the vendor companies have created new and faster detector systems, the underlying commercial indexing algorithm has not undergone significant updates or improvements after the initial development years. The effectiveness of the Hough-based indexing approach depends on the signal strength of the Kikuchi bands with respect to the background signal, and this is the Achilles Heel of the commercial implementations: if bands cannot be detected, then the indexing algorithm fails. In this presentation, we will begin with a discussion of a forward model for the simulation of EBSD and related diffraction patterns. Then we introduce the basic principles of the dictionary indexing approach, as well as the recently introduced spherical indexing algorithm. We will illustrate the robustness of both approaches with respect to pattern noise and the ability to index overlapping patterns near grain boundaries. Along the way we discuss a series of examples on both materials and geological systems. We conclude with preliminary results of the use of convolutional neural networks to accelerate the dictionary indexing approach.

The Presenter

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 director of the J. Earle and Mary Roberts Materials Characterization Facility (MCF). He has published nearly 350 papers in peer-reviewed journals as well as two textbooks, one on transmission electron microscopy, the other on crystallography and diffraction. His research interests include magnetic and structural materials, 3D microstructure characterization, as well as physics-based modeling of characterization modalities.

Convener

Professor Joanne Etheridge
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