

## *Novel Indexing Approaches for EBSD: Using the Complete Pattern*

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 can not 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. We conclude with a series of examples on both materials and geological systems as well as a discussion of new approaches to reflector selection and pseudo-symmetry resolution.