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**DEVELOPMENT AND APPLICATION OF SUBMICRON-RESOLUTION
THREE-DIMENSIONAL X-RAY STRUCTURAL MICROSCOPY***

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Development and Application of Submicron-Resolution Three-Dimensional X-Ray Structural Microscopy*

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Third-generation synchrotron x-ray sources, high-precision x-ray focusing optics, and white microbeam Laue diffraction developments have made possible revolutionary advances in x-ray capabilities for 3D microstructural investigations. In this presentation we discuss 3D differential-aperture x-ray structural microscopy (DAXM) that provides measurements of the structure, orientation, grain-morphology, and stress/strain tensor in single-crystal, polycrystal, composite, functionally-graded, or deformed materials with submicron point-to-point resolution. Based on the use of differential-aperture (i.e. knife-edge) diffracted beam profiling, full Laue diffraction patterns, and hence full diffraction information, can be obtained from submicron volume elements. Applications in progress on the UNI-CAT beamline at the APS include polycrystal structure, grain-growth, elastic strain, and nanoindent deformation and the fundamental importance of nondestructive 3D capabilities with submicron resolution will be discussed.

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