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MATERIALS GENOME INITIATIVE SEMINAR SERIES

# Studying the Micromechanics of Martensitic Phase Transformations using High Energy Diffraction Microscopy

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**ABSTRACT** Modern theories of the micromechanics of martensitic phase transformations are nearly 80 years mature. Experiments to verify these theories at the micro-scale, however, are a relatively new success, as definitive ex-situ observations of these mechanisms are difficult. New non-destructive in-situ High-Energy Diffraction Microscopy (HEDM) techniques are being developed to address this gap. Nickel-Titanium and Iron-Palladium shape memory alloys, and also 301L Stainless Steel, have been used as model materials in the first experiments. In this presentation, we will review the new micromechanical insights arising from these experiments. We will conclude with a generalization of the capabilities created by these new experiments as they may be applied to other solid materials where the kinematics of microstructural interfaces play critical roles in defining material performances, such as functional ceramics and soft magnets.

***Aaron P. Stebner*** *is an Assistant Professor in Mechanical Engineering and Materials Science at Colorado School of Mines. He received his Ph.D. from Northwestern University and was a Postdoctoral Scholar at the Graduate Aerospace Laboratories of the California Institute of Technology. He received an NSF-CAREER award in Mechanics of Materials and Structures for his work developing 3D in-situ X-ray diffraction experiments to study multiaxial micromechanics of phase transformations and plasticity in solids. He currently serves as President of the ASM International Organization for Shape Memory and Superelastic Technologies (SMST) and also Chair of the International Conference on Martensitic Transformations (ICOMAT).*