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Abstract for an Invited Paper
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In situ x-ray diffraction and imaging studies of structural and geological materials under dynamic loading

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New opportunities to study the evolution of microstructure of materials in response to dynamic loading are enabled by the development of new x-ray sources and detectors. This talk will focus on recent experiments on structural and geological materials under loading at strain rates of on the order of 10^3 s^{-1} . Examples will include diffraction studies of texture evolution in polycrystalline magnesium alloys and martensitic phase transformations in steel and Ni-Ti, along with preliminary static phase contrast imaging studies of defects in single-crystal quartz and sandstone. The talk will emphasize general principles and experimental considerations in developing *in situ* x-ray experiments. Two primary themes will be how to take best advantage of the characteristics of the x-ray source and detector, and the limits that these characteristics place on the samples and loading conditions that can be studied. The talk will conclude with a discussion of prospects for future developments in the field in light of continuing advances in x-ray sources and detectors.