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The role of crystallographic defects in the impact failure of armor materials

Abstract: Over the past five decades there has been an intense effort to understand and control the thermomechanical response of materials in extreme environments. A number of technologies critical to our safety and well-being stand to benefit from such understanding including armor and defense systems, next-generation fission and fusion reactors, spacecraft shielding, vehicular crashworthiness, and advanced manufacturing. Materials in such extreme environments often exhibit complex, somewhat non-intuitive mechanical behavior that is difficult to predict with empirical or phenomenological models. Here we discuss our development of a number of multiscale, mechanism-based models that help unravel this inherent complexity. This seminar will focus primarily on the development of an atomistically-informed crystal plasticity framework for deformation and failure of shock compressed single crystals and polycrystals. We further utilize this multiscale modeling framework to provide key insights into the development of reduced-order models, which are helpful in guiding the microstructural design of advanced light-weight armor and shielding materials.

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In 2017, Dr. Wilkerson joined the Department of Mechanical Engineering at Texas A&M University as an assistant professor and the James J. Cain Faculty Fellow II. Prior to returning to A&M, he was an assistant professor in the Department of Mechanical Engineering at the University of Texas at San Antonio. Wilkerson also spent one year as a Donald D. Harrington Faculty Fellow with the Department of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin. Wilkerson obtained his B.S. with highest honors from Texas A&M followed by an M.S.E and Ph.D. from Johns Hopkins University, where he worked with the Hopkins Extreme Materials Institute (HEMI).



Dr. Wilkerson's academic achievements have been recognized and supported by a number of honors and awards, including the Harrington Faculty Fellowship, the AFOSR Young Investigator (YIP) Award, the Ralph E. Powe Junior Faculty Award, the National Science Foundation (NSF) Graduate Research Fellowship, the National Defense Science and Engineering Graduate (NDSEG) Fellowship, and the Ammon S. Andes Award presented annually to recognize the nation's top aerospace engineering graduate.