



**MUMS Program Opening Workshop
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SPEAKER TITLES/ABSTRACTS

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“Modeling and Algorithmic Aspects of UQ for Material with Multiscale Behavior”

Increasingly, materials can be designed and built as a system, with constituents and components interacting with each other both locally and via longer range coupling. Examples of these materials include composites and multifunctional materials as well as materials synthesized through additive manufacturing processes. In all these instances, physical interactions are mediated through thin interfaces thus exacerbating the effect of compositional and functional gradients. In many such instances, small perturbations in physical specifications, be they geometrical mechanical or chemical, for any of the constituents, have tangible implications on system-level performance.

Accounting for many of the relevant uncertainties is hampered by the nature of physical interactions that magnify the interplay between modeling deviations and parametric deviations. It is also challenged by the computational complexity required for simultaneously resolving behaviors that are relevant to damage nucleation and propagation across constituents and components.

In this talk I will describe our experience in tackling some of these challenges in the context of NCF composites. Our efforts to link manufacturing processes with performance and cost analyses required the development of novel numerical algorithms that facilitated a more thorough statistical exploration of model validation issues. Our ability to iterate on model development and experiments permitted us to chart a path towards model improvement and ultimately validation.