Department of Civil and Environmental Engineering Distinguished Lecture

Multipurpose Room, Student Community Center

4pm-5pm, Friday, October 5th, 2018
Reception follows talk in the patio adjacent to the room

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Fracture in Steel Structures: from microns to meters

Abstract

Ferritic steels constitute much of the existing and planned civil and marine infrastructure worldwide. The affordable cost and widespread availability combined with continuing improvements in strength, fracture, fatigue and corrosion properties make steel ubiquitous for the construction of high-performance structures including long-span bridges, pipelines, pressure vessels, turbines, offshore platforms, ships, submarines and key components in aerospace vehicles. Yet, despite a half-century of progress in understanding the fracture behavior of steels, the most challenging research and practical issues remain unresolved. The fracture process that triggers failure in exceedingly large structures begins with complex interactions at the metallurgical scale of just tens of microns. Rigorous linking of the very small -to- the very large has proven exceedingly difficult. Developments in nonlinear and computational mechanics together with high-fidelity laboratory experiments form an effective path for progress to span the length-scales. This seminar focuses on understanding the behavior of ferritic steels over the ductile-to-brittle temperature transition region as an example of remarkable progress over the past twenty-five years following this approach. The new developments address simultaneously the coupled effects of plasticity and strong stochastic variability at the micro-scale to provide practitioners with valuable, quantitative tools for engineering-scale design and assessment.