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FACULTY RESEARCH

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CHRISTOPHER J. EARLS

Earls’ research involves the development and application of new computational techniques for the study of important problems involving engineered systems. He also focuses on developing novel approaches for solving deterministic and stochastic inverse problems, and is concerned with developing novel algorithmic and computational approaches that enable new understanding concerning the actual condition, and future performance of complex structural systems.

KENNETH C. HOVER

Hover studies the life-cycle of concrete beginning with influence of ingredients, proportions, weather conditions, and temperature on rates of setting, shrinkage, and strength-gain. He explores freeze-thaw durability of concrete and masonry, and investigates enhanced sustainability via supplementary cementitious materials, extended service life, and performance specifications.

DAVID S. KAMMER

Kammer’s focus is on the mechanics of dynamic and transient phenomena leading to failure of materials and structures. His research is focused on the effects that small- and meso-scale properties have on the overall response of solids and structures with particular interest in heterogeneous materials and interfaces.

MIRCEA D. GRIGORIU

Grigoriu’s research uses random vibration, stochastic calculus, stochastic differential equations, numerical methods for solving stochastic problems, probabilistic models for microstructures, wind/earthquake engineering, and Monte Carlo simulation. His teaching focuses on engineering applications starting from fundamental concepts of mechanics, probability theory, statistics, and mathematics.

GREG C. MCLASKEY

McLaskey’s research uses seismic waves to study the mechanics of friction, earthquakes, fracture, impact and other processes that generate sounds and vibrations in solids. He also specializes in piezoelectric sensors which are used to detect very high frequency but small amplitude vibrations in solid materials; these vibrations are used for monitoring or detecting damage in buildings, bridges, and other civil infrastructure.

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In choosing to go to Cornell, I was most attracted to the Civil and Environmental Engineering School. I was interested in a line of research that was more computational than experimental, and I had that opportunity here at Cornell, where non-traditional degree options are encouraged. I spoke with Professor Earls before making my decision, and he had a project that aligned extremely well with my interests; so I decided Cornell was the best place for me.

SEISMICITY

Waves recorded by piezoelectric sensors are offset by their distance along the fault line to visualize the propagation of the rupture front of a specific earthquake. Instead of sliding as a rigid body, the moving granite block will slide partially at certain locations while remaining locked at others, resembling tectonic plate motion.

BILL WU

One focus of the McLaskey research group is to investigate the mechanisms of earthquakes using a state-of-the-art rock mechanics apparatus. It consists of one stationary granite block and one moving block, each weighing around 4000 pounds. They represent tectonic plates in the earth, whose relative movements create earthquakes. During a typical experiment, the shear force is slowly increased until the moving block transitions from stick to slip, usually accompanied by a large ‘bang’. With a dense array of sensors (measuring slip, seismicity, and strain) scattered near the fault line, we record the propagating waves that originate from each tiny earthquake to learn about the source and nucleation of laboratory-scale earthquakes.
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“Supercomputers are the bread and butter of every computational science research group these days, and the hive cluster is ours. It enables us to conduct large-scale atomistic simulations that are infeasible with desktop computers. The cluster has about 700 processors which is eye-catching for a group of our size.” - Sepehr Saroukhani, Ph.D.


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I am working with my advisor Dr. Derek Warner on understanding fracture and deformation of structural materials using atomistic simulations. At small length scales, we focus on atomistic simulations of defects, phase transformations and mechanical properties of materials, using empirical-based and physics-based tools such as classical molecular dynamics simulation and density-functional theoretical calculations. Currently, I’m investigating dopant and environmental effects on the fracture toughness of silicon carbide, utilizing these computational techniques.

I chose Cornell because I was most interested in the cutting-edge structural engineering research program available here. The resources at Cornell provide an intellectually and culturally rich environment for study and research in structural engineering. I particularly enjoy working with Dr. Warner, studying deformation of materials at the atomistic level using the supercomputing resources on campus. During my leisure time, I enjoy playing badminton with friends, skiing in the winter, and kayaking on Cayuga Lake in the summer.
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