ENGINEERING PROJECT PORTFOLIO

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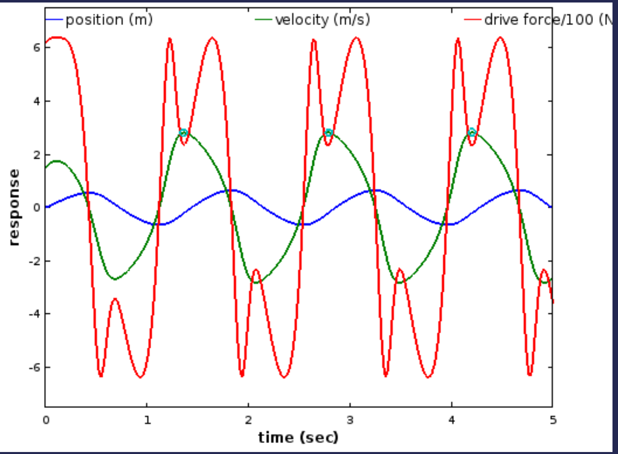
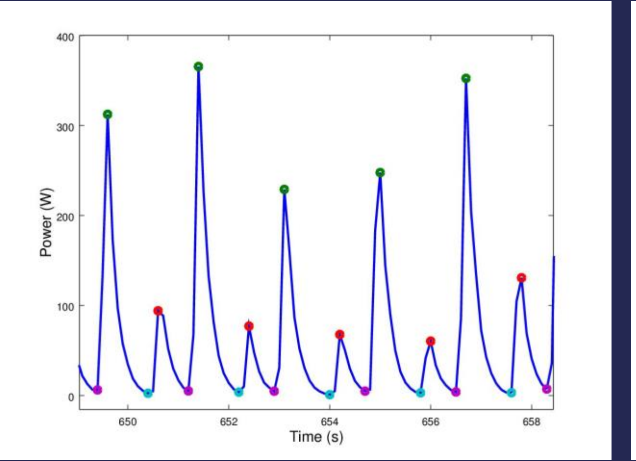
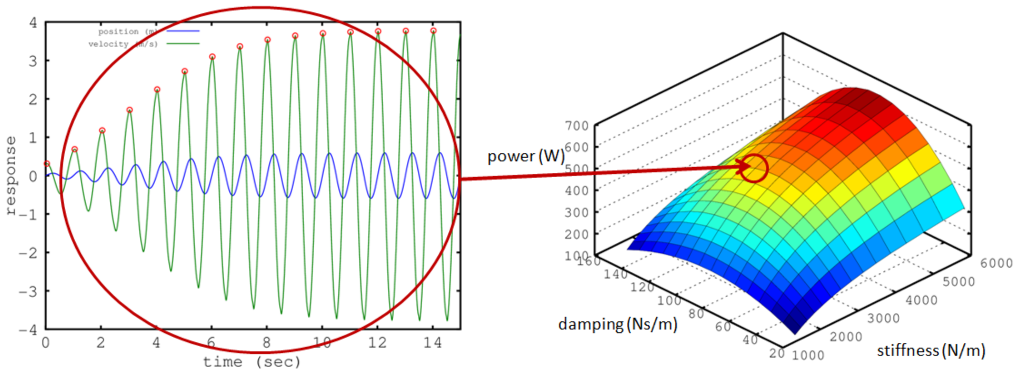
HYDROPOWER STARTUP COMPANY

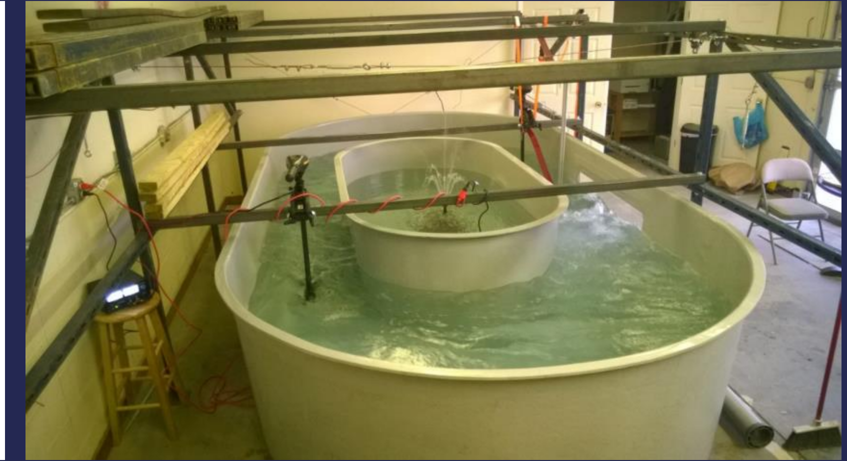


I served as the VP of Technology Development in the launching of a hydropower company. We developed an energy harvester for rivers that would not require dams or spinning turbine blades for regions that do not have access to large electrical grids. I helped write the proposals that won SBIR funding from the Office of Naval Research and the National Science Foundation. I wrote software to simulate and analyze the physics of the machines we considered and tested and designed a flow chamber that cost less than 1/20th of similarly-sized commercial systems.



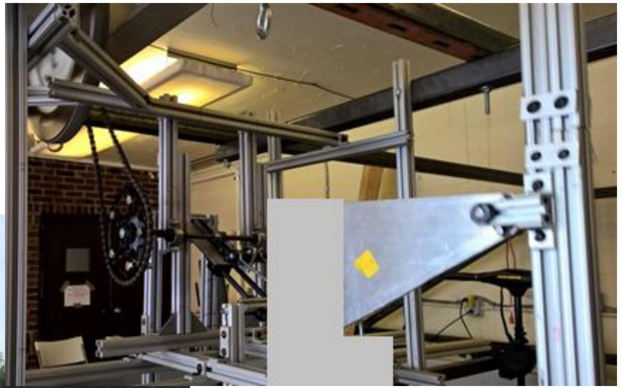


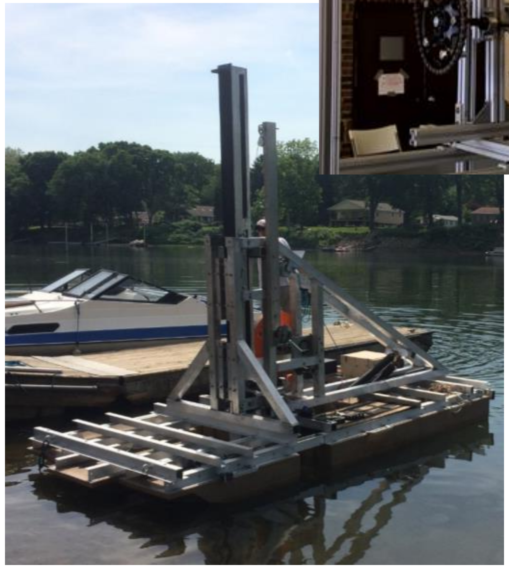
Each point on a survey map corresponds to a time simulation.



HYDROPOWER STARTUP COMPANY (CONT.)

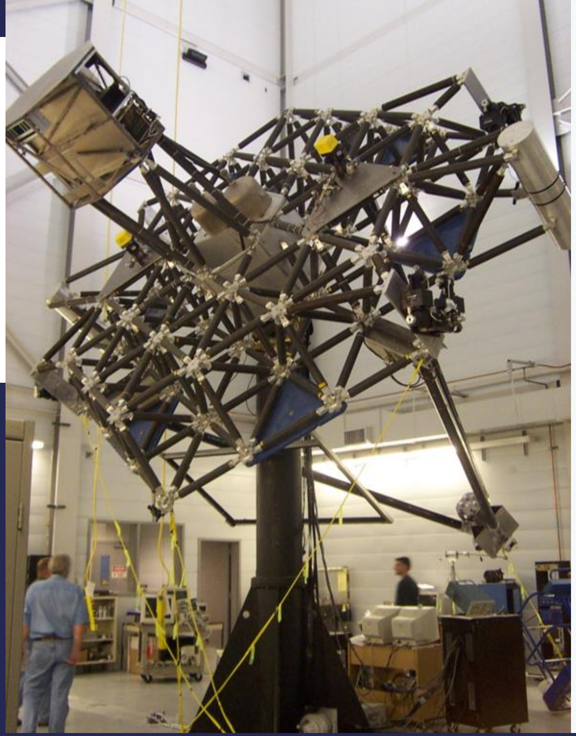
We built many designs and increased power harvesting several orders of magnitude over the course of development. Maintaining an oscillation in a turbulent environment, harvesting as much as possible without stalling, over a wide range of flow rates which changes the power available and frequency of the periodic driving force, required mechanisms that enabled system dynamics that would evolve with the flow rate.

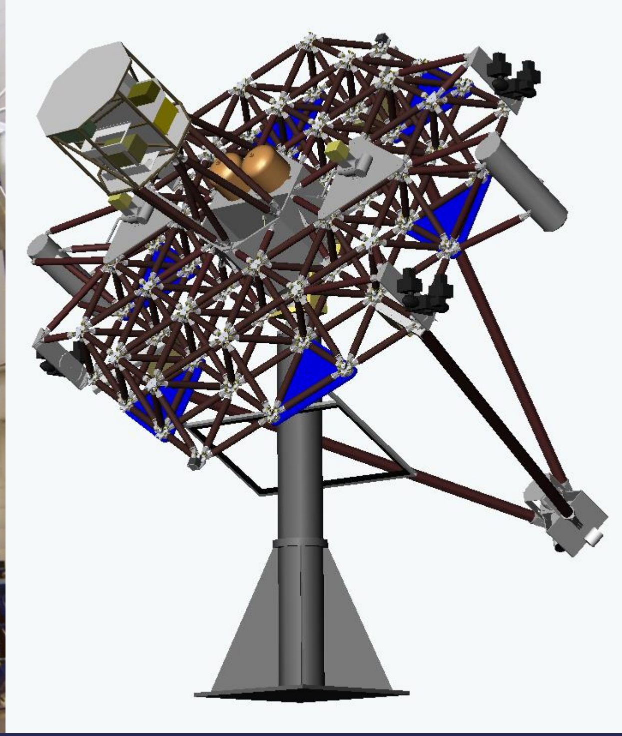


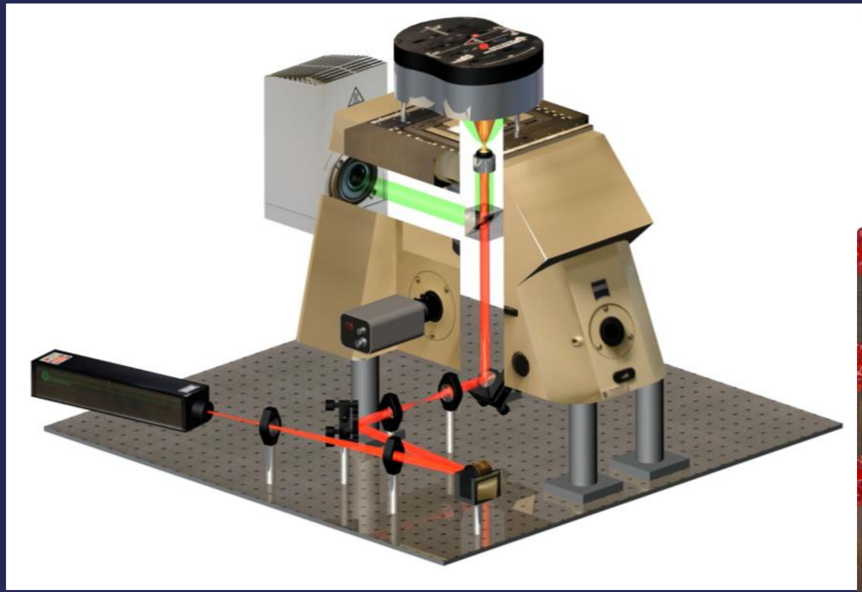


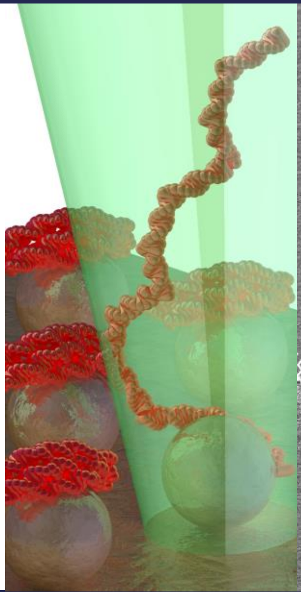
SOLID MODELING

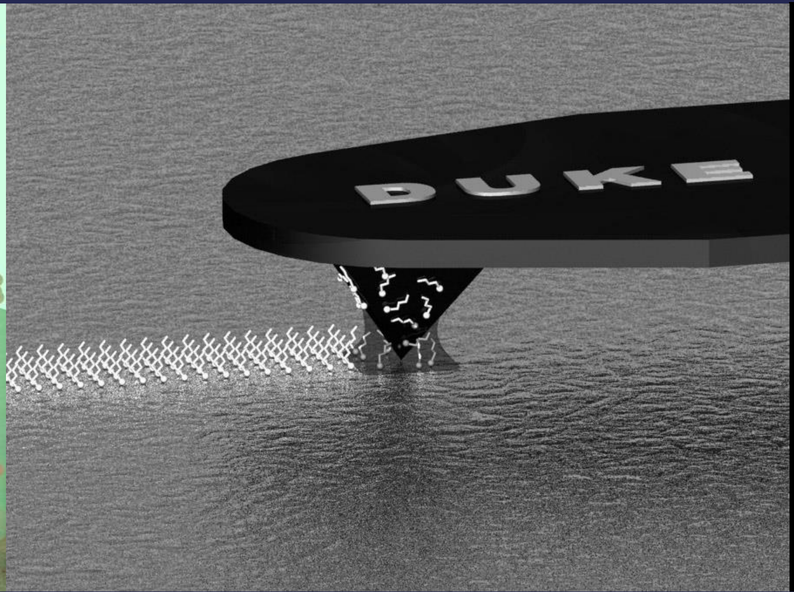
I learned to model in Solidworks when I created a mass model of a 30′, 2500-part satellite dynamics test bed for the Air Force Research Lab – Space Vehicles Directorate. With a tape measure, a pair of calipers, and a hydraulic boom lift, I took the measurements needed to create a model that had a center of mass within 0.05″ of the spherical air bearing center. Solid modeling has been a part of every position I have held since. I have designed prototype hardware and machine drawings for countless tests and created illustrations for presentations, proposals, patents, publications, and a textbook.

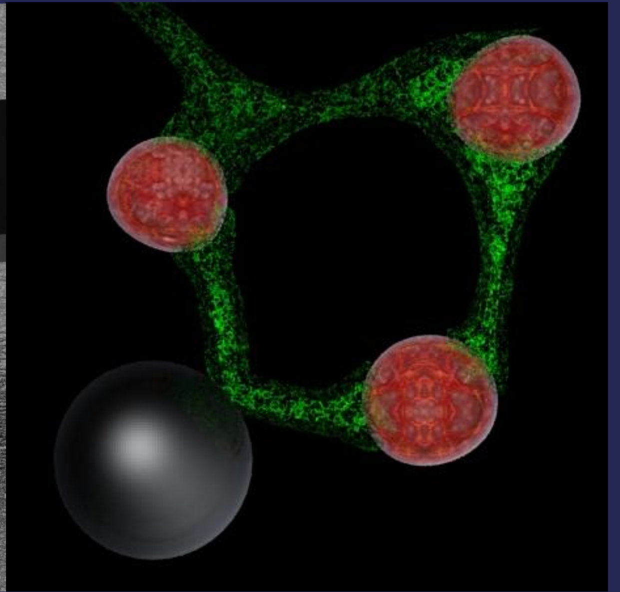








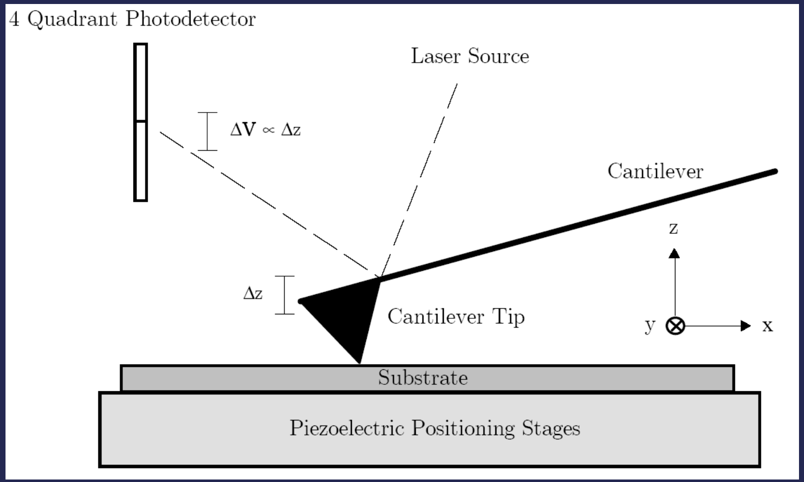


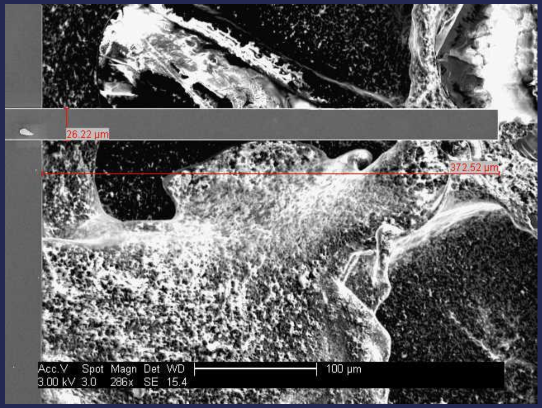


ATOMIC FORCE MICROSCOPY

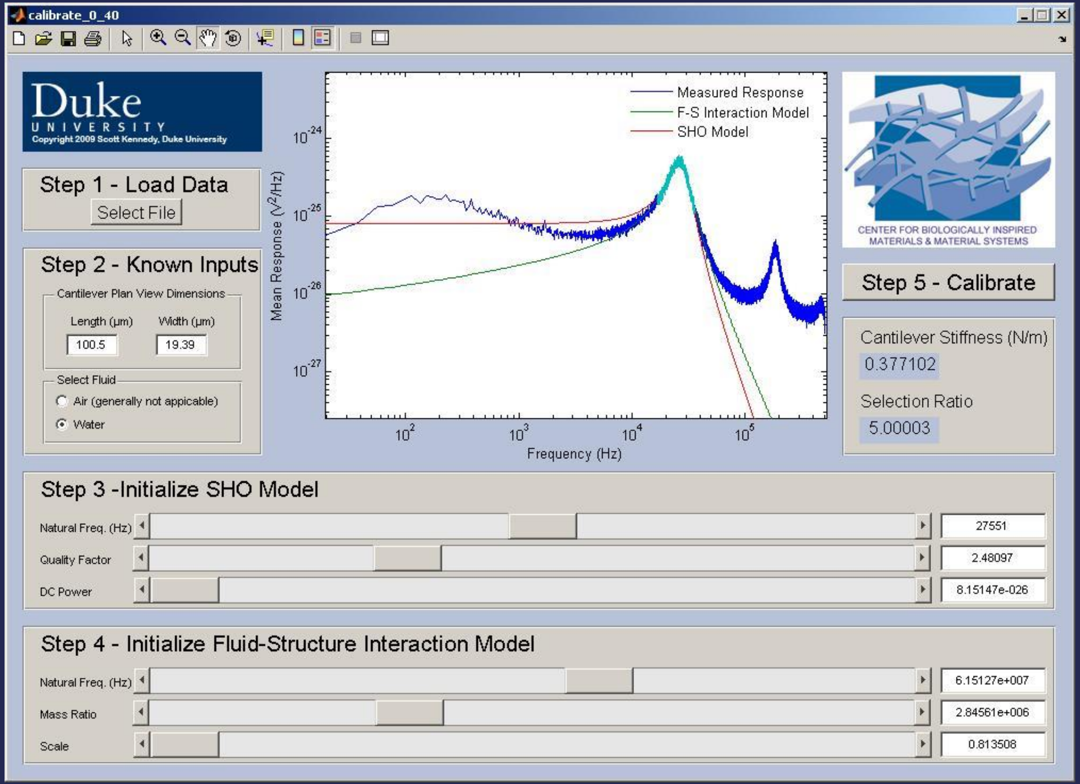
Atomic force microscopy is a technique where a microscopic cantilever beam is used as a probe by sensing the bending of the beam by monitoring movement of a laser spot reflected off the end of the cantilever. If the bending stiffness of a beam can be calibrated, very small forces can be measured, for example, the forces associated with unzipping a strand of DNA.

My dissertation at Duke centered on finding an improved calibration method based on a model of the random thermal vibrations for probes in liquids for biological applications and other contributions to the field including signal processing recommendations that were published in a textbook and assistance with the development of an ISO calibration standard.



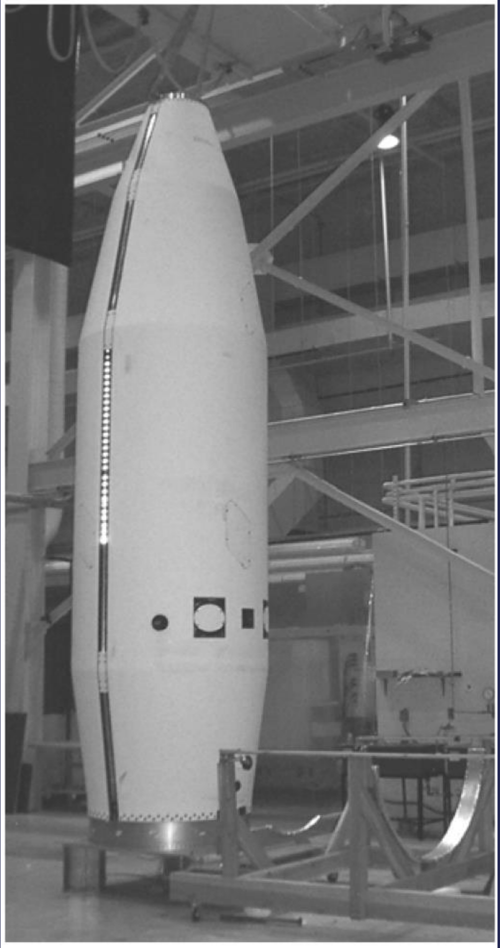


Micro-scale cantilever dimensions can be measured using an electron microscope.



I created this GUI in Matlab to allow a user to initialize parameters and then use my calibration algorithm.

ACOUSTICS & VIBRATIONS



I have significant experience testing hardware to characterize noise and vibration issues in the automotive and aerospace industries. From left-to-right, pictured here there is a Minotaur fairing I conducted acoustic studies on, a welded truss used in a study on the damping imparted by cables, patent illustrations of a device that would damp rocket fairing panel vibrations, and a miniature rocket payload dummy and suspension that mimicked the dynamics of a full-scale system for the demonstration of a system that allowed shock isolation to motion on one axis while remaining stiff to rocking motion.