Modeling of the Nonlinear Response of a Microcantilever: Understanding Higher Order Harmonics and Resonances J.D. TAYLOR, JAY GALLIARD, MALCOLM SKOVE, APPARAO RAO, Clemson University — The most promising and readily scalable detection scheme for micro and nanocantilevers is electrostatic excitation and capacitive detection. This method has proven difficult to implement because of a large parasitic capacitance which masks the dynamic signal from the cantilever. Fortunately, the cantilever response exhibits several higher order harmonics and resonant peaks that can be exploited to avoid the parasitic capacitance and dramatically improve the signal to noise ratio. In this report a theoretical model of the cantilever response is presented that explains these higher order harmonics and resonances by considering nonlinear effects. Also, an experiment is presented in which the response of a microcantilever is measured simultaneously using laser reflectometry and capacitive techniques in order to separate the effects of current modulation and mechanical motion.

Gayatri Keskar
Clemson University