Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

**Probing Mechanical Properties of Carbon Nanotubes by Light Scattering** YANG WU, FENG WANG, MINGYUAN HUANG, LIMIN HUANG, MATTHEW Y. SFEIR, LOUIS E. BRUS, STEPHEN O'BRIEN, JAMES HONE, TONY F. HEINZ, Columbia University, New York, NY 10027 — An important capability for studying and exploiting the remarkable mechanical properties of carbon nanotubes is the detection of their physical motion. Here we present a scheme based on light scattering by a nanotube placed slightly off-center of a tightly focused laser beam. The approach permits measurement of the movement of individual single-walled carbon nanotubes with nanometer sensitivity and high detection bandwidth. The method can be readily combined with optical characterization by Rayleigh scattering spectroscopy for studies of well-defined nanotube structures [1]. The technique is demonstrated for suspended pristine nanotubes, as well as for nanotubes modified by mass loading. By passing a current through the nanotube in the presence of a magnetic field, we can apply static and oscillating Lorentz forces. In this fashion, we have produced both static deflection and vibration excitation of nanotubes. Sharply defined nanotube vibrational modes are observed by sweeping the frequency of the driving force. We discuss the nature of these resonances and how to extract fundamental nanotube properties from the measurements. [1] M. Y. Sfeir, Science **306**, 1540 (2004).

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Date submitted: 30 Nov 2005 Electronic form version 1.4