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Dynamics of a Disturbed Sessile Drop Measured by Atomic Force Microscopy[1] PATRICIA MCGUIGGAN, SAMUEL ROSENTHAL, ANDREA PROSPERETTI, Johns Hopkins University — A new method for studying the dynamics of a sessile drop by atomic force microscopy (AFM) is demonstrated. A hydrophobic microsphere (radius, r $\sim$ 20 - 30 μm) attached to an AFM cantilever is brought into contact with a sessile water drop. Immediately after the initial rise of the meniscus, the microsphere oscillates about a fixed average position while partially immersed in the liquid. The small ($<$ 100 nm) oscillations of the interface are readily measured with AFM. The oscillations correspond to the resonance oscillation of the entire droplet. Although the microsphere volume is 6 orders of magnitude smaller than the drop, it excites the normal resonance modes of the liquid interface. Resonance oscillation frequencies were measured for drop volumes between 5 and 200 μL. The results for the two lowest normal modes are quantitatively consistent with continuum calculations for the natural frequency of hemispherical drops with no adjustable parameters. The method may enable sensitive measurements of volume, surface tension, and viscosity of small drops.

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