

## **Frustrated Water at a Hydrophobic Interface**

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### **Abstract**

Understanding hydrophobic interfaces is important for a wide variety of fields (from protein folding to designing stain resistant clothing), yet the details are hotly disputed. Hydrophobic substance hates water by definition, however what happens when water is forced into intimate contact with a hydrophobic surface? We have employed three surface-sensitive techniques, modified surface forces apparatus, time-resolved phase-modulated ellipsometry and X-ray reflectivity, to study the water-hydrophobic interface. We have observed strong evidence for an ultra-thin low-density layer of interfacial water near a macroscopic hydrophobic surface as predicted by some recent theories and computer simulations. We have also unexpectedly observed giant fluctuations in the low-density layer with the spatial (over contact area of 10s microns) and temporal (with a time constant of 30 milliseconds) averaging inherent in the measurement. Accordingly, a flickering capillary wave-like interface is pictured for water meeting a hydrophobic surface.