# van der Waals interactions between sharp probes and flat sample surfaces

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Based on rigorously macroscopic arguments, a theory of van der Waals interactions between probes of various geometries and a flat sample surface is derived. While the spatial resolution of force sensing is shown to depend solely on probe geometry and probe-sample spacing, the magnitude of the force is additionally determined by the dielectric permittivities of probe, sample, and surrounding mediums. Polar immersion liquids considerably reduce van der Waals forces and may cause a transition from attractive to repulsive interactions. Apart from emphasizing some fundamental aspects, the derived results are of certain relevance to long-range scanning force microscopy.