

Abstract Submitted
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Stiff particles on highly compliant solid substrates: adhesion or wetting? KATHARINE JENSEN, ERIC DUFRESNE, Yale University — The classic theories of contact mechanics with deformable materials account only for the competition between adhesion energy and elasticity. However, for compliant materials, solid surface tension also plays an important role in resisting shape change, and may significantly modify the physics of contact with soft matter. We report experiments bringing small, stiff spheres into adhesive contact with compliant silicone substrates. We observe the quasi-static deformation of the substrate in two sticky situations: with zero applied force, where the spheres are allowed to settle to an equilibrium position, and during forced withdrawal from contact starting from an initial condition of zero displacement. In both cases, we map the profiles of the deformed silicone surface, and compare to capillary and elastic theories. The similarities – and differences – between our experimental measurements and the classic theories point to a crossover from a capillary-dominated near field response close to the contact line to an elastic-dominated response in the far field.

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