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Deformation of an Elastic Substrate Due to a Resting Sessile Droplet[1] AARON BARDALL, KAREN DANIELS, MICHAEL SHEARER, North Carolina State University — On a sufficiently soft substrate, a resting fluid droplet will cause significant deformation of the substrate. This deformation is driven by a combination of capillary forces at the contact line and the fluid pressure at the solid surface. These forces are balanced at the surface by the solid traction stress induced by the substrate deformation. Young's Law, which predicts the equilibrium contact angle of the droplet, also indicates an a priori radial force balance for rigid substrates, but not necessarily for soft substrates which deform under loading. It remains an open question whether the contact line transmits a non-zero force tangent to the substrate surface in addition to the conventional normal force. This talk will present a model for the static deformation of the substrate that includes a non-zero tangential contact line force as well as general interfacial energy conditions governing the angle of a two-dimensional droplet. We discuss extensions of this model to non-symmetric droplets and their effect on the static configuration of the droplet/substrate system.

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