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Sandwiched drops and magnified substrate deformations JASON S. WEXLER, HOWARD A. STONE, Princeton University — The Laplace pressure and contact line force of a wetting sessile drop (radius R) are strong enough to deform the surface of a soft elastic media (~ 25 kPa) by distances on the order of microns. If the drop, instead of being sessile, is squeezed flat in a gap ($h \ll R$) between two elastic substrates, the resulting forces are much stronger (by a factor $R/h \gg 1$). In fact, a similarly soft material will deform by distances that are orders of magnitude larger than in the sessile drop case. We present an analytical theory that predicts a relationship between drop volume and substrate displacement. In particular, unlike the sessile drop case, where larger deformations correspond to smaller drops, here we find that larger drops lead to greater displacements. We solve for the volume at which the two surfaces first come in contact, and test the predictions of our model with a series of experiments.

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