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Interaction of Drops on a Soft Substrate LUUK A. LUBBERS, JOOST H. WEIJS, Physics of Fluids Group, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands, SIDDHARTHA DAS, Department of Mechanical Engineering, University of Alberta, Alberta, Canada T6G 2G8, LORENZO BOTTO, Department of Chemical Engineering, Imperial College, London, United Kingdom, BRUNO ANDREOTTI, Physique et Mecanique des Milieux Hétérogènes, UMR 7636 ESPCI -CNRS, Univ. Paris-Diderot, 10 rue Vauquelin, 75005, Paris, France, JACCO H. SNOEIJER, Physics of Fluids Group, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands — A sessile drop can elastically deform a substrate by the action of capillary forces. The typical size of the deformation is given by the ratio of surface tension and the elastic modulus, γ/E, which can reach up to 10-100 microns for soft elastomers. In this talk we theoretically show that the contact angles of drops on such a surface exhibit two transitions when increasing γ/E: (i) the microsocopic geometry of the contact line first develops a Neumann-like cusp when γ/E is of the order of few nanometers, (ii) the macroscopic angle of the drop is altered only when γ/E reaches the size of the drop. Using the same framework we then show that two neighboring drops exhibit an effective interaction, mediated by the deformation of the elastic medium. This is in analogy to the well-known Cheerios effect, where small particles at a liquid interface attract eachother due to the meniscus deformations. Here we reveal the nature of drop-drop interactions on a soft substrate by combining numerical and analytical calculations.

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