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Wetting, spreading and capillary adhesion: putting shape-instability to purpose

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Surface tension drives shape-change of a liquid/gas interface at length scales below the capillary scale. The reconfiguration of a liquid/gas interface in contact with a solid substrate depends on liquid wetting of the substrate and on the contact-line mobility. This talk will be about exploiting capillary reconfiguration to design a device. Putting instability to purpose demands a thorough analysis of the instability. We will present examples, making connection to the requisite background analysis. Some analyses are classical, others new. Applications described will include i) the beetle-inspired switchable capillary adhesion device and ii) droplet manipulators that exploit contact-line instabilities of mechanically-excited sessile drops. Design of these manipulators benefits from a periodic table of drop frequencies related to symmetry-breaking of the spherical-cap, only recently available.