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FIG. 1. (a) Assembled collage of droplet interactions. Droplets of PG and water were mixed at various dilution dyed with food coloring and allowed to autonomously interact. Images were assembled into a single frame, typical droplet volume $0.1\text{--}5\ \mu\text{l}$. (b) Kymograph of two droplets interacting over 18 s (blue droplet 25% PG, orange droplet 1% PG, scale bar 3 mm). The motion can be broken into a long-range phase before droplet contact and a short-range phase after droplet contact. (c) Sequence of images from two droplets interacting (blue droplet 25% PG, orange droplet 1% PG, scale bar 3 mm). $t = 0\text{ s}$ to $t = 5\text{ s}$, short-range interactions. $t = 5\text{ s}$ to $t = 8\text{ s}$, long-range interactions. (Multimedia view) [URL: <http://dx.doi.org/10.1063/1.4894407.1>]

Dancing droplets: Autonomous surface tension-driven droplet motion

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When droplets of water and food coloring at different concentrations are deposited on a clean glass slide they enter a complex dance (Fig. 1(a)).

We reproduce this phenomenon by using a two-component mixture of propylene glycol and water deposited on corona treated (Electro-Technic BD-20AC) glass slides and record the phenomena using a Cannon 5D Mark II camera with a 50 mm macro lens. When 2 mm-size droplets are deposited apart, they move towards each other. This attraction happens even if the droplets have exactly the same concentration, leading to the coalescence of both droplets into one. If droplets have different concentrations, they enter a chasing phase,¹ where the droplet of smaller water concentration chases the other for up to several minutes (Figs. 1(b) and 1(c)). Two droplets will attract each other across a gap in the substrate illustrating that long-range attraction is vapor mediated. When two droplets are deposited on the glass, each one evaporates and forms a gradient of water vapor² (water is 100 times more volatile than propylene glycol). The vapor gradient from one droplet destabilizes the other, giving rise to an attraction between the droplets, even if they have the same concentration.

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