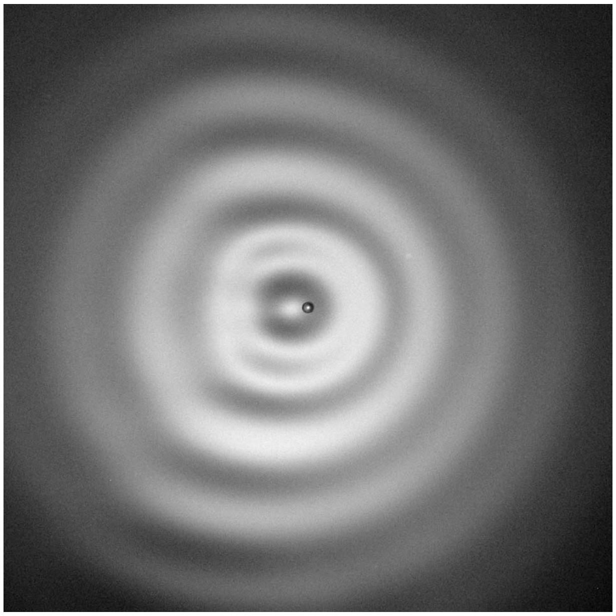

FIG. 1.

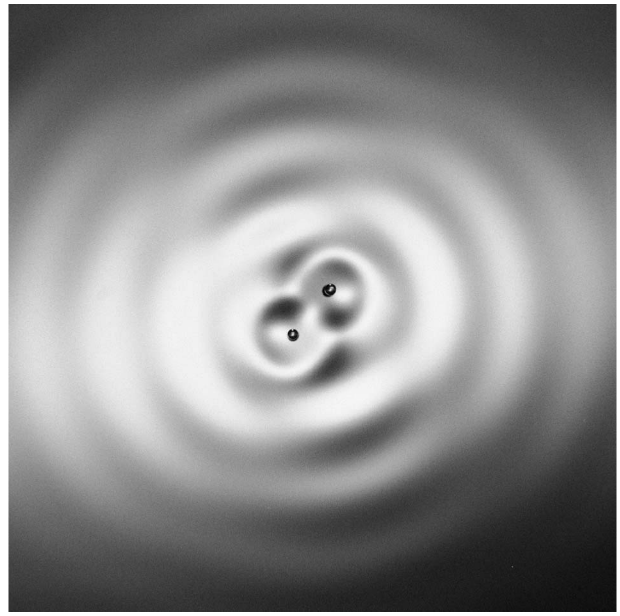

FIG. 2.

Orbital motion of bouncing drops

S. Protière and Y. Couder
Laboratoire Matière et Systèmes Complexes and Laboratoire de Physique Statistique de l'ENS, 75231 Paris Cedex 05, France
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Usually a drop placed at the surface of the same liquid coalesces within a few tenths of seconds. Here we present an experiment in which this coalescence process is inhibited by vibrating the liquid on which the drop is placed. The drop can then bounce on the surface of the liquid for an unlimited amount of time. In a recent article,[1] the acceleration threshold for which drops of various sizes keep bouncing on the surface was determined. The crucial role of the intermediate air film to prevent the coalescence process was thus demonstrated.

For liquids of low viscosity, just below the Faraday instability threshold, the bouncing drop undergoes a drift bifurcation and starts moving in the horizontal plane.[2,3]

Figure 1 shows a drop "walking" across the surface of the liquid at constant velocity. The liquid used is silicon oil of viscosity 20×10^{-3} Pa s, the forcing frequency is $f_0 = 80$ Hz, and the forcing acceleration is $\gamma_m/g \approx 3.9$. The picture shows that the drop falls on the slope of the wave it formed at its previous bounce, thus giving the drop its horizontal motion. Also, the formed wave is Doppler shifted: the wavelength is shorter ahead of the walker and longer behind it. The formed wave is periodically altered by the drop's next bounce.

When two walkers are placed at the surface of the liquid, the two drops will interact via their waves.[4] Figures 2 and 3 show the result of an attractive collision of two identical walkers via their waves. The two drops are then orbiting around their centers of mass. Each drop falls on the inner slope of the wave emitted by the other drop, giving it its centripetal motion and thus allowing it to rotate.

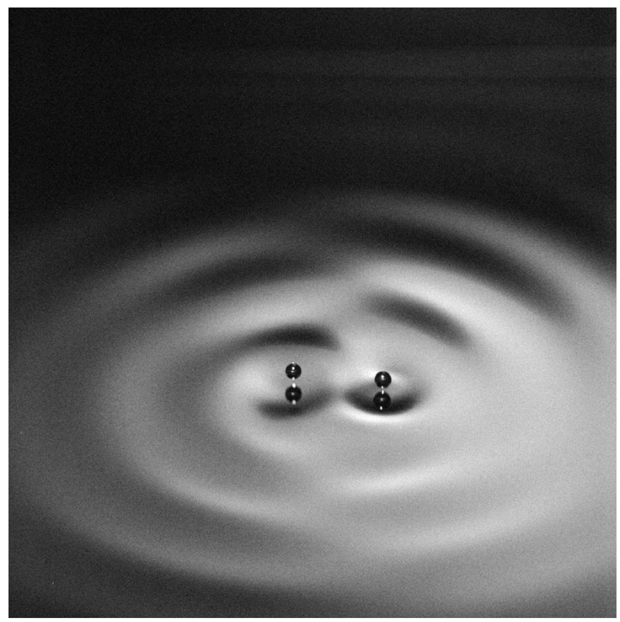

FIG. 3.

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