Thermal Active Drops

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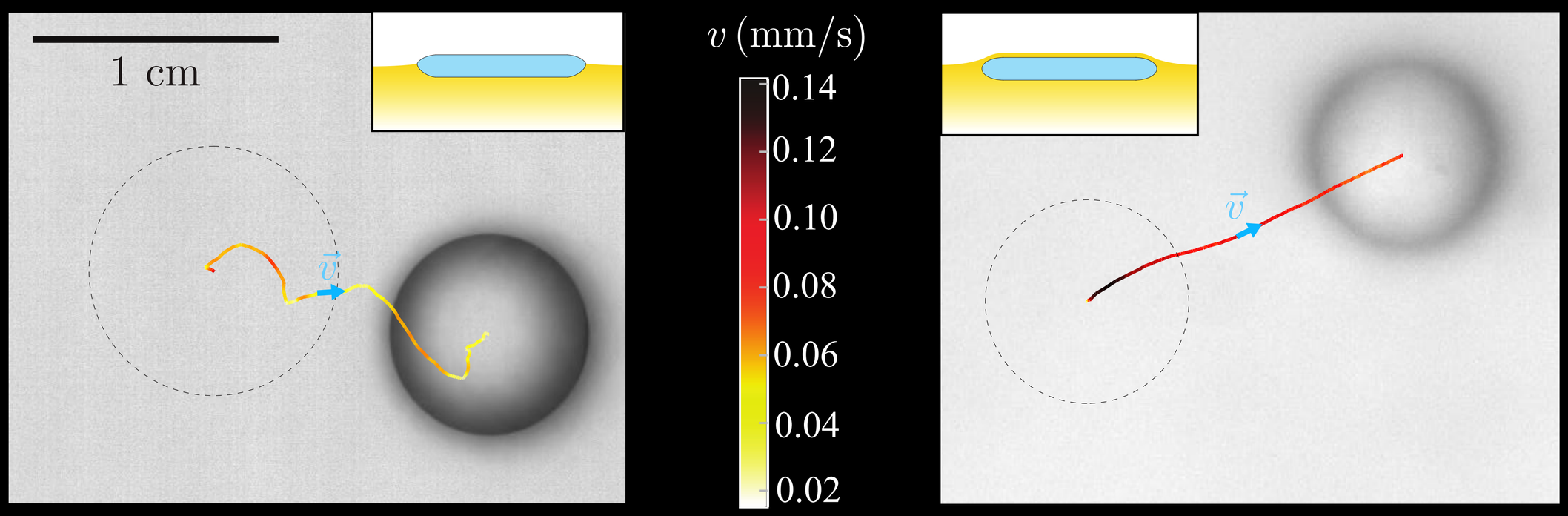
When a drop of volatile alcohol is deposited onto the surface of a bath of immiscible liquid, the drop spontaneously propels on the surface.

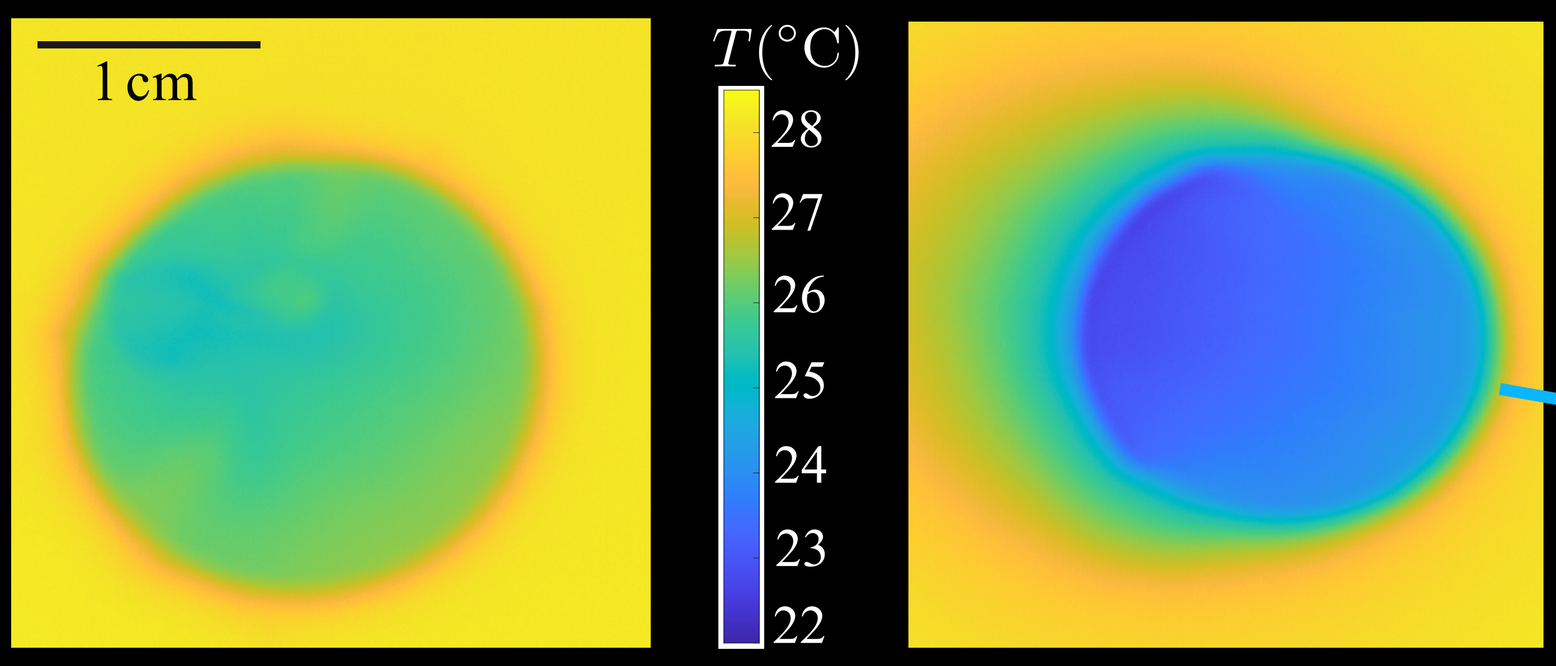
Evaporation energy is converted into directed motion.



The presence of a thin film of bath liquid coating the drop is associated to straighter trajectories.

Self-propulsion is triggered by a thermocapillary convective instability.

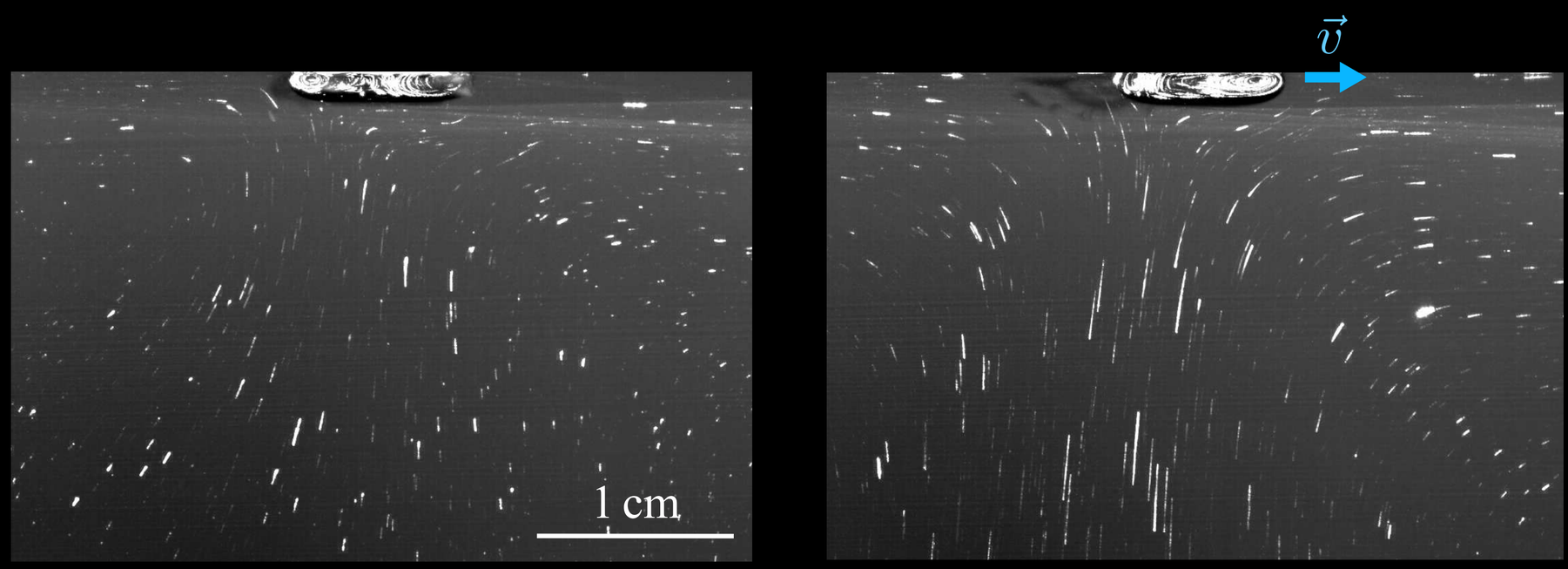
Spontaneous symmetry breaking of the surface temperature field...



*Initial **symmetric** temperature field*

*Final **asymmetric** temperature field*

...results into asymmetric thermocapillary stresses and symmetry breaking of the hydrodynamic flows.



*Initial **symmetric** hydrodynamic flow*

*Final **asymmetric** hydrodynamic flow*

A propulsive force emerges as a result of the viscous stress response of the liquid bath to the Marangoni stress exerted on the drop's lower interface.

In contrast to a solid Marangoni surfer, our drop propels in a direction opposite to the interfacial tension gradient. The propulsion scheme is rather similar to a classical squirmer.