Researchers identify movement of droplets on soft surfaces

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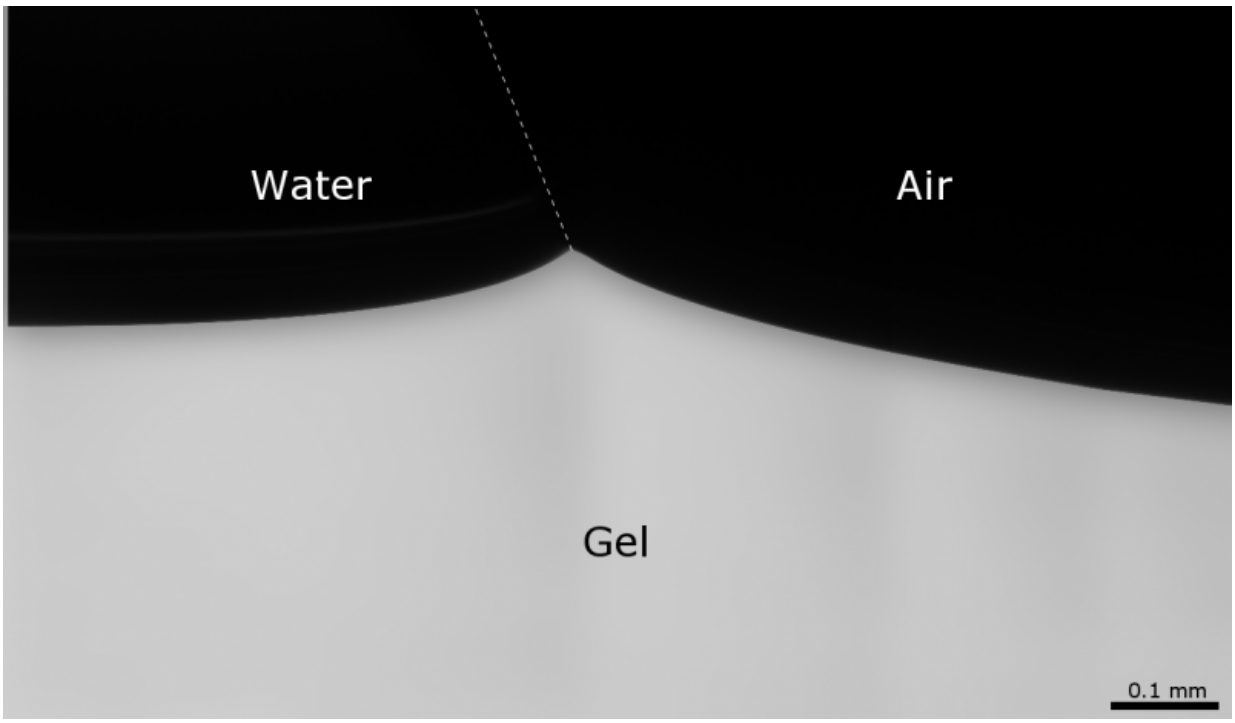

Researchers from the University of Twente have succeeded in clearly identifying why droplets on soft, squishy surfaces react differently than on hard surfaces. A water droplet, for example, moves very differently over jelly than over glass, but the science of how this works has never been investigated. Better understanding of this phenomenon is of

importance for a variety of applications where droplets come into contact with extremely soft, deformable materials, as is the case in 3D printing, soft contact lenses or sauces such as mayonnaise. The result was published in the renowned scientific journal *Nature Communications*.

Due to the surface tension in the liquid, minuscule 'ridges' arise at the edge of the droplet on the soft, jellylike surface. "That little ridge is always there, even if the droplet is motionless", explains UT researcher Stefan Karpitschka. "Surface tension is a force in the liquid surface, which makes droplets and bubbles spherical. This force is also the reason why insects are able to walk on a water surface. Normally the force of the surface tension is much too weak to deform the areas under the droplet. However, for very soft materials, this effect is suddenly very important, especially for the sliding movement of the droplets. This is because the friction caused by the movement of the little ridge in the gel is much larger than the internal friction in the liquid."

If the droplet moves over the surface, these miniscule ridges move in a wave-like manner. In some cases, the droplet 'surfs' downwards from the tiny ridge and makes an unexpected, jerky movement.

3D printing, contact lenses and mayonnaise

The most important application for this fundamental research lies in the field of inkjet printing. In this case molten materials are printed in the form of droplets, which then harden into 2D images or 3D structures. Current research shows how the molten droplets can distort the partially solidified materials and how this affects the droplet motion. Other applications where materials are deformed under the influence of surface tension are, for example, contact lenses, mayonnaise, and the manufacture of nano-structures on microchips.

More information: "Droplets move over viscoelastic substrates by

surfing a ridge," *Nature Communications* 6, Article number: 7891, DOI: 10.1038/ncomms8891

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