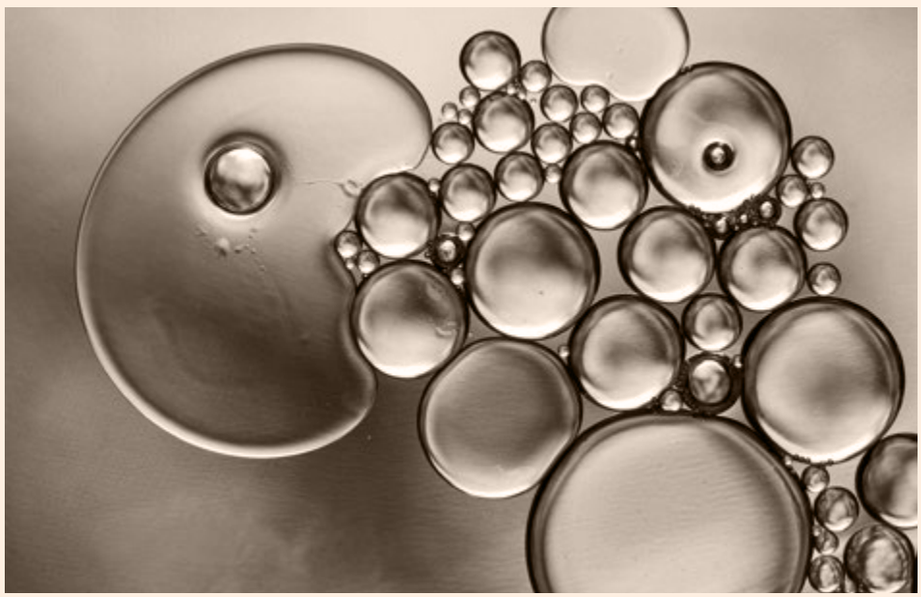
‘DANCING’ OIL DROPLETS MAY BE BUILDING BLOCK FOR SYNTHETIC CELLS



Oil droplets on water • Photo Shutterstock

In water, minuscule oil droplets behave like a school of fish, discovered Master’s student Noor Appelman during her thesis research. She published her discovery in a scientific journal.

If you put droplets of oil in water, they spontaneously start ‘dancing’. This was discovered by MSc student Noor Appelman (Molecular Life Sciences) and assistant professor of Physical Chemistry and Soft Matter Siddharth Deshpande. ‘Together, the droplets do something very different than you would expect based on a single droplet,’ says Deshpande. ‘It is what is called an emergent phenomenon. We normally see this in complex biological systems like a swarm of starlings or a school of fish, but our research shows it can also occur in simple, non-living systems.’ This kind of emergent behaviour of droplets was already familiar in non-living systems with three ingredients, but Appelman and Deshpande now succeeded with just two: water and oil, in this case decanol. They recently published their results with two other co-authors in the journal *Advanced Materials Interfaces*. Appelman discovered the droplet dance by chance during an experiment for her Master’s thesis. ‘Through the microscope, I suddenly saw that drops of decanol rose to the surface one by one, and pushed the other droplets away.’ The oil droplets float just underwater because they are very small.

‘THE WAY THE DROPLETS SEPARATE AND COME BACK TOGETHER LOOKS LIKE A DANCE ’

Once in a while, an oil droplet breaks through the water surface, and a thin layer of oil quickly spreads out from it. This happens due to the Marangoni effect, a physical phenomenon known from tears of wine. The outward flow pulls the underlying water, and the other oil droplets along with it, which looks as though one drop pushes the rest away. Simultaneously, the layer of oil evaporates, drawing more oil out of the droplet and thus keeping up the flow. At some point, the oil layer disappears, and all the droplets move towards each other. When they next droplet breaks the surface, the dance begins all over again.

Anyone wanting to try this at home will probably be disappointed. It won’t work with olive oil. ‘Olive oil consists of various long-chain fatty acids, so the oil evaporates much more slowly,’ Deshpande explains. ‘Moreover, the droplets must be smaller than one-tenth of a millimetre in diameter.’ The researchers only managed to produce such small droplets in the lab using specialized equipment.

Synthetic cell

According to Deshpande, the discovery represents a possible building block for a synthetic – human-made – cell. ‘I want to build tiny vesicles that move like living cells. A cell can sense its environment and move in response. In a way, these oil droplets can do that too.’ The next step is to build the oil droplets into the outside shell of the vesicles. ‘Maybe we can attach the oil droplet to the outside like a pouch so that the vesicle can respond to its environment and other vesicles.’ ss