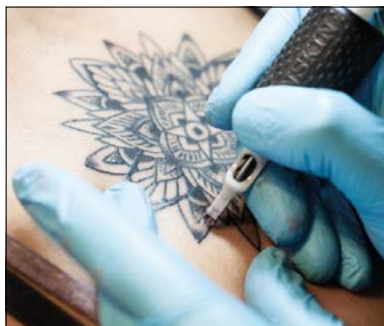


Sciencewatch

COMPILED BY JOHN SWAIN, NORTHEASTERN UNIVERSITY

Tattoo ink travels in body

The inks in tattoos are supposed to remain confined to the skin, but a recent study by Andreas Luch of the German Federal Institute for Risk Assessment in Berlin and colleagues shows that elements within inks are transported in micro- and nanoparticle forms from the skin to regional lymph nodes. The team used synchrotron X-ray fluorescence at the European Synchrotron in Grenoble, France, to track the presence of various elements *ex vivo* in tattooed tissues. The results revealed the first evidence for the transport of various organic and inorganic pigments and toxic-element impurities,



The hazards that potentially derive from tattoos had previously only been investigated by chemical analysis of the inks and their degradation products in vitro.

such as heavy metals and titanium dioxide. Fourier-transform infrared spectroscopy also revealed ultrastructural changes in tissue next to tattoo particles and elevated lipid contents, which may contribute to inflammation and other problems associated with tattooing.

● Further reading

I Schreier *et al.* 2017 *Sci. Rep.* **7** 11395.

Three hundred kinds of ice

Ice is commonly thought to have a hexagonal crystal structure, as reflected in the symmetry of snowflakes. Along with cubic ice, which is found in the upper atmosphere, these are the only crystalline forms of ice found in nature so far. Now, Takahiro Matsui and colleagues at Okayama University in Japan suggest that this is merely the tip of the iceberg. Using classical molecular dynamics simulations, the team found over 300 new kinds of porous ice structures derived from zeolite frameworks and space fullerenes. Despite being a vast increase over the 17 ice polymorphs found experimentally so far, they only exist at very low – even negative – pressures and temperatures near absolute zero.

● Further reading

T Matsui *et al.* 2017 *J. Chem. Phys.* **147** 091101.

Rat nightmares

Nightmares are familiar to humans, but it now seems rats can have them too. Gabrielle Girardeau and colleagues at New York University put rats in a maze and blasted them in the face with an unpleasant, yet harmless, burst of compressed air. As the rats slept later, patterns of activity arose in their hippocampi corresponding to their mental map of the maze, but activity in the amygdala, a region involved in emotion, also showed up whenever the blast of air was activated.

● Further reading

G Girardeau *et al.* 2017 *Nat. Neurosci.* doi:10.1038/nn.4637.

Climate and leaf size

The sizes of leaves vary by more than five orders of magnitude among plant species worldwide, yet the reason why has remained mysterious. Ian Wright of Macquarie University in Australia and colleagues have now characterised the patterns of leaf sizes for 7670 plant species together with climatic data from 682 sites worldwide, and report consistent patterns that explain why earlier predictions had limited success. The results also provide a quantitative explanation for leaf-size variation with latitude: for much of the world, a key factor limiting leaf size turns out to be night temperature and the associated risk of frost damage.

● Further reading

I Wright *et al.* 2017 *Science* **357** 917.



Plants outside of tropical climes have smaller leaves that are more robust against cold.

Helicity dynamics in water

Vortices are an interesting feature of fluid motion. William Irvine of the University of Chicago and colleagues have now shown that the helicity of vortices, which is a measure of the degree to which vortex lines wind around each other, can remain constant even in viscous fluids. Helicity is conserved in the absence of viscosity, but can be dissipated in real (viscous) fluids. Observing the twisting, linking and writhing of hydrofoils in water, the team shows that twisting dissipates vortex tubes while writhing and linking conserve them. The result could allow helicity to be manipulated in real fluid flows, with implications for atmospheric flows ranging from turbulence to the formation of tornadoes.

● Further reading

M Scheeler *et al.* 2017 *Science* **357** 487.

Farewell to Cassini

On 15 September, having expended the last of its rocket propellant, NASA's Cassini probe was deliberately crashed into Saturn following an epic two-decade-long journey of exploration. The mission has revolutionised our understanding of the complex Saturn system, in particular its moons and rings, and broadened our knowledge about life in the solar system. The first spacecraft to orbit Saturn, Cassini has led to hundreds of scientific papers and shaped the future of planetary exploration.

● Further reading

saturn.jpl.nasa.gov.



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