BIOADHESIVES

## Sticky plants

*Proc. Natl Acad. Sci. USA* **113,** E3193–E3202 (2016)

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English ivy — a creeping plant — is known to secrete a yellowish sticky substance when it climbs vertical surfaces. This glue-like secretion, which contains spherical nanoparticles, helps the plant to attach onto surfaces as it climbs. Researchers in the US have now shown that these nanoparticles are composed mainly of arabinogalactan proteins, which are important in promoting strong adhesion.

Mingjun Zhang and co-workers — at the Ohio State University, the University of Georgia and the University of Tennessee — isolated the sticky substance from ivy rootlets and characterized it using various microscopy and chemical methods. The nanoparticles are about 70 nm in diameter and have a negatively charged surface at pH 7.0. Tests using a phenylglycoside dye confirmed the presence of arabinogalactan proteins — a hydroxyproline-rich glycoprotein typically present in the extracellular matrix of plant cells and other botanic adhesives. The nanoparticles showed low intrinsic viscosity in solution and this gives the adhesive a favourable wetting behaviour. Furthermore, due to their size, the nanoparticles are thought to penetrate easily into any surface irregularities, further promoting intimate interactions with the substrate onto which the plant clings. Calcium ions contribute to the curing of the adhesive by promoting electrostatic binding between the nanoparticles and pectin. When the nanoparticles, pectin and calcium ions were combined, the bioadhesive characteristics were reproduced, further validating the adhesion mechanism. *ALC*

GRAPHENE

## Chiral Andreev Hall modes

*Science* **352,** 966–969 (2016)

Josephson junctions based on graphene are an ideal environment for the development of exotic physical phenomena. In the presence of an external magnetic field, graphene enters the quantum Hall state, where its gapped nature prevents the propagation of conventional Andreev states within the bulk. Theoretical arguments suggest that two conducting chiral channels confined to opposite edges are able to sustain supercurrents. This is different from topological insulators, where a single edge is enough to conduct carriers in two directions. However, these phenomena have not yet been demonstrated experimentally.

Now, François Amet and Gleb Finkelstein at Duke University, along with colleagues from institutions in Japan and the US, demonstrate the interplay of superconductivity and the quantum Hall effect in graphene-based heterostructures with superconducting MoRe contacts. The researchers performed back-gated magnetotransport measurements in the sub-kelvin limit, where the thermal energy is comparable to the characteristic Josephson coupling strength for the chosen current values. Magnetic fields of ~2 T ensured that the radius of the cyclotron orbit was smaller than both the junction length and the mean free path. At the same time, the opposite free edges were far enough apart to prevent edge coupling through conventional Andreev reflections. Remarkably, the behaviour of the differential resistance unambiguously showed signatures of edge-confined, spatially inhomogeneous supercurrents. *GP*

CATALYSIS

## Working in tandem

*Chem. Sci.* http://doi.org/bj6v (2016)

Many sequential chemical reactions cannot be performed in the same vessel as they require chemically incompatible reagents or catalysts. However, chemists have devised ways in which otherwise incompatible catalytic groups can be kept spatially separated by using specific porous substrates, such as molecular organic frameworks, and some examples of one-pot orthogonal reactions have been reported. Now, Beatriu Escuder at the Universitat Jaume I in Spain and Jan van Esch and co-workers at the Delft University of Technology in The Netherlands have extended this approach to supramolecular hydrogels.

The authors targeted a tandem reaction: an acid-catalysed acetal deprotection followed by a base-catalysed aldol condensation. The two catalytic groups, a carboxylic acid and a chiral amine, respectively, are incorporated in the structural motif of two distinct hydrogelators. In solution, these hydrogelators assemble to form spatially separated networks so that the nominally incompatible — acidic and basic — reactions do not interfere with one other and proceed in tandem. In the presence of a protected acetal and a ketone as substrates, Escuder and co-workers report an 85% yield of the final aldol condensate with high enantioselectivity. *AM*

ATOMIC FORCE MICROSCOPY

## Setting standards

Preprint at http://arxiv.org/abs/1605.07750 (2016)

Accurate calibration of cantilevers for atomic force microscopy (AFM) is imperative for making robust force measurements. There are a number of methods for calibrating the torsional spring constant of a cantilever for AFM. However, these calibrations are not made using a global standard so no simple method exists for comparing data from AFM labs around the world. Now, John Sader and colleagues from The University of Melbourne, along with researchers from institutions in Australia, Ireland and Sweden, have developed an online tool to standardize the calibration of cantilevers.

The Global Calibration Initiative (GCI) is an online tool (sadermethod.org) for AFM users to compare force measurements. Users upload their AFM thermal method measurements for the spring constant, resonant frequency and quality factor for a given cantilever. Their data is then averaged to reduce the uncertainty in the measured spring constant. To illustrate the initiative, calibration data from five labs were compared and large variations on individual cantilevers were observed. However, on averaging the acquired dataset, the GCI was used to accurately determine the hydrodynamic function (and thus enable calibration) of a series of unknown cantilevers. As the dataset is widened, the calibration should become more accurate, allowing calibration of any cantilever geometry. *BLB*

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