

NANOMATERIALS

Sunblock stays on skin surface

Using nanoparticles to encapsulate the ultraviolet (UV) filters found in sunscreen might prevent them from being absorbed by the skin — and could even improve their UV-blocking performance.

Some studies have shown that chemical UV filters have negative effects on cells when they penetrate skin. To stop this absorption, Mark Saltzman and his colleagues at Yale University in New Haven, Connecticut, coated a typical UV filter — padimate O — with nanoparticles that have sticky aldehyde groups on their surfaces. The coated UV filters stuck to the skin of mice and pigs even when exposed to water, and the nanoparticles prevented the filters from penetrating the skin.

Sunblock that used these nanoparticles and contained only 5% of the amount of UV filters found in conventional sunblock absorbed the same level of UV radiation.

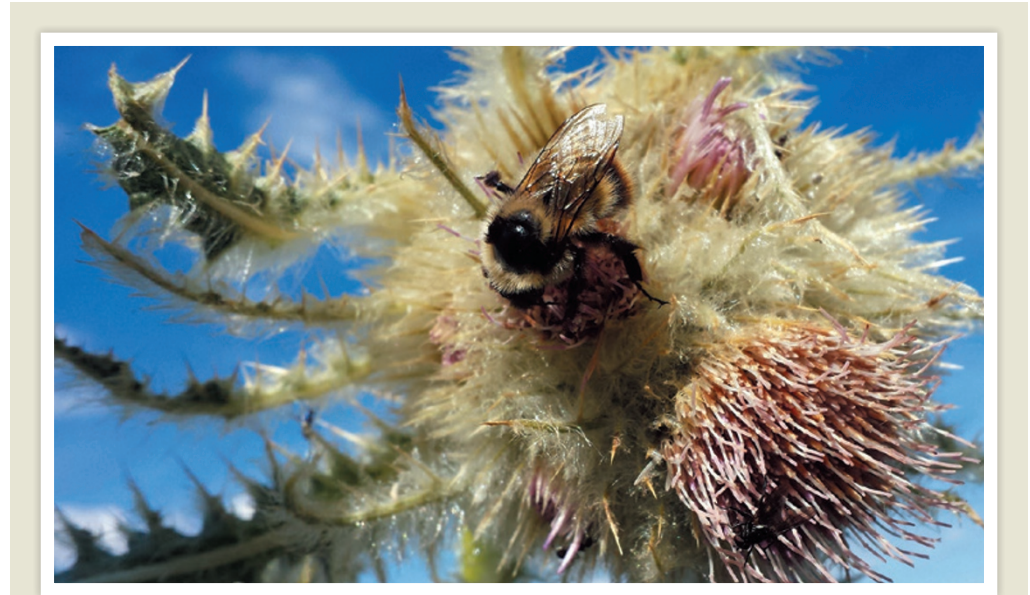
Nature Mater. <http://dx.doi.org/10.1038/nmat4422> (2015)

ANIMAL BEHAVIOUR

Fish launches jaw to feed on land

A species of fish has an unusual way of eating — it thrusts its jaw out and downwards to nab prey on land.

Krijn Michel at the University of Antwerp in Belgium and his colleagues took high-speed video and made 3D reconstructions of the largescale four-eyed fish (*Anableps anableps*), which feeds from mudbanks. They found that the fish extends and rotates its upper jaw towards the ground while it turns its



NICOLE MILLER-STRUTTMANN

EVOLUTION

Bee tongues shrink as climate warms

Bees in some parts of the US Rocky Mountains have evolved shorter tongues, probably in response to a decline in flower populations caused by climate change.

Nicole Miller-Struttman at SUNY College in Old Westbury, New York, and her co-workers studied bees at three alpine sites in the Rocky Mountains. Similar to other mountainous habitats around the world, the Rockies have seen a drop in the number of flowers because

of warmer temperatures and drier soils. The researchers measured the tongues of 170 bees and found that they have got shorter by an average of about two millimetres since the 1970s in two dominant bee species in that area, *Bombus balteatus* and *Bombus sylvicola*.

Shorter tongues allow bees to feed on nectar from a greater variety of flowers, rather than from just long-tubed blooms.

Science 349, 1541–1544 (2015)

lower jaw downwards at a right angle, allowing it to clamp its mouth around its prey.

This mechanism differs from those of other land-feeding fish, which either curl their whole bodies downwards or pivot on their fins towards prey. *J. Exp. Biol.* 218, 2951–2960 (2015)

CLIMATE CHANGE

Clean air puts Arctic ice in peril

Cleaner air in the high north could reduce Arctic sea ice by an area of about one million square kilometres this century. Air pollution has a net

cooling effect on the climate, and has partially offset the decline of Arctic sea ice since the mid-1970s. John Fyfe and his colleagues at the Canadian Centre for Climate Modelling and Analysis in Victoria, Canada, used an Earth-system model to simulate sea-ice changes in the twenty-first century with and without projected reductions of global aerosol emissions. Cleaner air accounted for 15–40% of the Arctic ice melting simulated under a range of greenhouse-gas emission scenarios.

In a model with high greenhouse-gas emissions and large projected reductions in

air pollution, the Arctic Ocean became seasonally ice-free in 2045 — 12 years earlier than when aerosol emissions were held at 2000 levels.

Geophys. Res. Lett. <http://doi.org/7tt> (2015)

PLANT BIOLOGY

CRISPR cripples plant viruses

Plants that have been engineered to contain the CRISPR–Cas9 system are resistant to viral infections that reduce crop yields.

The CRISPR system, first discovered in bacteria, uses

certain RNA molecules as guides to recognize specific DNA sites in genomes that the Cas9 enzyme then cuts. Two groups of researchers have designed guide RNAs to target and disrupt DNA from geminiviruses, which infect many crops. Caixia Gao of the Chinese Academy of Sciences' Institute of Genetics and Developmental Biology in Beijing and her colleagues focused on the beet severe curly top virus. They found that transgenic CRISPR-Cas9 plants had 60–80% less viral DNA than control plants, and did not show disease symptoms such as leaf curling. Similarly, Daniel Voytas of the University of Minnesota in Minneapolis and his colleagues targeted the bean yellow dwarf virus genome and found 5–87% less viral protein in infected engineered plants.

This strategy could be used to develop disease-resistant transgenic plants, the teams say. *Nature Plants* <http://dx.doi.org/10.1038/nplants.2015.144> (2015); <http://dx.doi.org/10.1038/nplants.2015.145> (2015)

MICROBIOLOGY

Diet makes gut change speed

Interactions between diet and gut microbes affect how quickly food moves through the gut.

To simulate dietary changes that occur when people travel to places with different cuisines, Jeffrey Gordon at Washington University in St Louis, Missouri, and his team took germ-free mice and transplanted them with gut microbes from people consuming one of five different diets from around the world. They then fed the mice a series of all those diets and measured transit

times of dye-stained food through the gut. They found that transit time



varied with different combinations of diet and microbial community, and that it correlated with certain metabolites produced by some bacteria.

Turmeric (pictured), a common ingredient in Bangladeshi food, in particular decreased gut motility in mice carrying microbes and eating food from Bangladesh — in part by increasing the production of bile acid, which was converted by microbes into compounds that slow down gut movement. The approach could be used to identify components of different diets that affect gut health, the authors say. *Cell* 163, 95–107 (2015)

ECOLOGY

Creatures are busy in the polar night

The high Arctic is thought to be biologically quiescent during the long 'polar night' — the winter months when the Sun never rises. But Jørgen Berge at the Arctic University of Norway in Tromsø and his colleagues have discovered a surprising level of biological activity.

During three winters in the cold and dark in Kongsfjorden, Svalbard, the team recorded, for example, growing bivalves, foraging seabirds, scavenging crabs and reproducing and respiring zooplankton.

The ecosystem seems to thrive without photosynthesis by relying on energy that has been stored or brought in with Atlantic water.

Curr. Biol. <http://doi.org/7xd> (2015)

ROBOTICS

Robot moves when squished

Soft elastic materials that buckle in a vacuum can generate robot motions.

George Whitesides at Harvard University in

SOCIAL SELECTION

Popular topics on social media

Gender-disparity study faces attack

Bias against women in science is a well-studied and well-documented phenomenon. But some cases may not be as clear cut as they first seem. A study published this week in the *Proceedings of the National Academy of Sciences* claimed that female researchers in the Netherlands are more likely than men to lose out when applying for grants. The paper gained widespread support on social media, but some commenters quickly raised doubts. In a blog post, Casper Albers, a statistician at the University of Groningen in the Netherlands, argued that the authors had fallen victim to a common statistical error, which negates the main finding. But the paper's lead author Romy van der Lee, a psychologist at Leiden University in the Netherlands, says that she stands behind the team's conclusion that gender affects success. *Proc. Natl Acad. Sci. USA* <http://doi.org/7v9> (2015)

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Cambridge, Massachusetts, and his colleagues built soft actuators out of squishy cubes containing air pockets. They attached rigid components such as grippers or legs to the cubes and sucked the air out of the pockets using a vacuum. This caused the cubes to collapse, driving the motion of the attached robot parts. When the vacuum was removed, the cubes returned to their original shape. By repeatedly changing the applied pressure, the team made robots that could walk or grab objects (pictured).

The buckling actuators can also be stacked to allow for more-complex motions, the authors report. *Adv. Mater.* <http://doi.org/f3gcnp> (2015)

CANCER IMMUNOTHERAPY

Molecular switch controls therapy

A molecular 'remote control' could enable researchers to make a powerful cancer

therapy safer.

The therapy relies on engineered immune-system cells called T cells that recognize and kill tumours, and has shown promise in clinical trials. But the T cells can also attack and damage healthy cells. James Onuffer and Wendell Lim at the University of California, San Francisco, and their colleagues designed an approach in which the T-cell receptors that recognize cancer cells are split in two, and will only assemble and function when triggered by a compound similar to the drug rapamycin.

T cells engineered in this manner only attacked their target cells in mice when the compound was present. The approach could provide a way to modulate the timing and intensity of engineered T-cell responses in humans.

Science <http://doi.org/7v4> (2015)

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