

## METEOROLOGY

### Air particles boost rain extremes

As the climate warms, tiny particles suspended in the atmosphere may have a greater effect than greenhouse gases on increasing the frequency of extreme rain and snowfall.

Greenhouse gases and atmospheric aerosols both drive extreme precipitation, which is expected to increase with climate change. To tease apart the climate effects, Zhili Wang of the Chinese Academy of Meteorological Sciences in Beijing and his colleagues used a global climate model to simulate scenarios with different levels of greenhouse-gas emissions.

They predict that, by the end of the century, aerosols will be two to four times more important than greenhouse gases in boosting precipitation extremes worldwide. Reducing aerosol emissions could help people to alter future climate-change impacts.

*Geophys. Res. Lett.* <http://doi.org/bqdf> (2016)

## EVOLUTION

### Why some groups have more species

Plants have diversified at almost twice the rate of animals, and animals and plants have accumulated new species some ten times faster than prokaryotes such as bacteria.

Across the tree of life, some groups have many more species than others. To find out why, Joshua Scholl and John Wiens at the University of Arizona in Tucson collated published data on the number of species and their phylogenetic relationships in each group of living organisms. Contrary to some hypotheses,

older groups did not have more species than young groups. Instead, the authors found that the balance of speciation and extinction over time, known as the diversification rate, determined most differences in species number between groups.

Ecological and evolutionary differences between the kingdoms of life could explain differences in diversification rates, the researchers say. *Proc. R. Soc. B* 283, 20161334 (2016)

## GENOMICS

### History of brewer's yeast revealed

People began to domesticate beer yeasts in the late sixteenth or early seventeenth century, when beer-making in Europe moved from homes to pubs and monasteries.

Kevin Verstrepen at the University of Leuven and Steven Maere at the University of Ghent, both in Belgium, and their colleagues sequenced the genomes of more than 150 strains of *Saccharomyces cerevisiae* (pictured) used to make bread, beer and other drinks. An evolutionary tree of the strains revealed distinct families of yeast, such as one used to make wine

and another sake, as well as two distantly related groups of ale yeast. The beer yeasts showed the strongest signatures of human influence. Beer-making strains carried variations and duplications of genes that break down maltose and maltotriose, the main sugars in beer.

The team used the genomic information to make a hybrid strain that has a high tolerance to alcohol and does not produce 4-vinyl guaiacol, which imbues unpopular clove and smoke flavours.

*Cell* 166, 1397–1410 (2016)

## MICROBIOLOGY

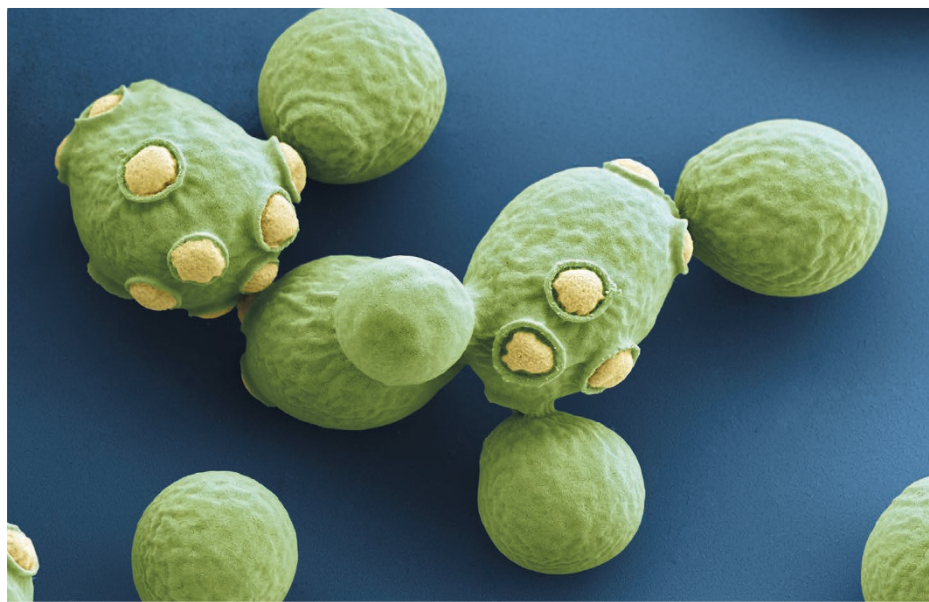
### Nanoparticles kill resistant bacteria

A synthetic polymer clears infections in mice caused by a multiple-drug-resistant bacterium.

Gram-negative bacteria are particularly hard to kill once they become drug resistant. To target them, Eric Reynolds, Greg Qiao and their colleagues at the University of Melbourne in Australia designed

star-shaped antimicrobial nanoparticles made of amino acids. The molecules killed several common Gram-negative pathogens in culture, and cleared infections in mice caused by *Acinetobacter baumannii*, which is resistant to several antibiotics. When cultured with sublethal concentrations of the nanoparticles for 24 days, *A. baumannii* did not grow resistant over 600 generations.

The nanoparticles hit multiple targets — disrupting



the bacterial outer membrane and the exchange of ions, and inducing pathways for cell death — and are likely to be more stable and less toxic than most antimicrobials under development, the authors say. *Nature Microbiol.* 1, 16162 (2016)

## ELECTRONICS

## Protection for transistors

The performance of transistors made of black phosphorus can be maintained with the addition of tellurium.

Layers of black phosphorus just a few molecules thick show great promise in advanced electronic devices. But exposure to oxygen and moisture causes damaging corrosion and bubbles to form within days. To avoid this, Zhongyuan Liu of Yanshan University in Qinhuangdao, China, and his colleagues produced samples of the material that were doped with the rare metalloid tellurium. This slowed bubble growth, and the material retained 50% of its conductivity after three weeks, whereas the undoped versions retained only 2%.

Similar approaches could allow black phosphorus to be used in high-performance batteries and computer memory, the authors say. *Adv. Mater.* <http://doi.org/f3rcsr> (2016)

## ASTRONOMY

## Galaxy collisions make waves fast

When galaxies with supermassive black holes at their centres collide, they could produce a burst of gravitational waves within just 10 million years.

Gravitational waves were first detected earlier this year, sparking great interest in finding more. Some scientists have predicted that wave production happens on timescales of a billion years or more, which would mean future searches would detect relatively few waves.

Fazeel Mahmood Khan at the Institute of Space Technology in Islamabad and his colleagues simulated a galaxy collision and predicted that there are many more such waves to detect.

This is a promising finding for projects that aim to look for gravitational waves, such as one proposed by the European Space Agency using the Evolved Laser Interferometer Space Antenna. *Astrophys. J.* 828, 73 (2016)

## INFECTION

## Feed a virus, starve a bacterium

Feeding mice helps them to fight viral infection, whereas starvation is a better strategy against bacterial infection — lending support to the proverb ‘feed a cold, starve a fever’.

Ruslan Medzhitov and his colleagues at Yale University School of Medicine in New Haven, Connecticut, studied the effects of feeding on mice that were infected with either the bacterium *Listeria monocytogenes* or an influenza virus. Bacterium-infected mice that were deprived of food stayed alive, whereas well-fed animals died. By contrast, almost all mice with flu died when they were starved, but most survived when they were fed. During bacterial inflammation, glucose from food inhibited a metabolic process that protects brain tissue from damage, whereas the sugar protected the brain during viral inflammation.

The findings suggest that different types of inflammatory response have their own metabolic programs. *Cell* 166, 1512–1525 (2016)

## ENGINEERING

## Fabric harvests two energy forms

A lightweight fabric can harvest both solar and mechanical energy to power electronic devices.

Zhong Lin Wang at the Georgia Institute of

Technology in Atlanta, Xing Fan at Chongqing University in China and their co-workers wove a fabric (pictured) using wool fibres and two types of polymer wire: a photovoltaic one and another that collects mechanical energy. The 320-micrometre-thick flexible fabric converted energy from both sunlight and movement, making enough electricity to charge a mobile phone or power a wristwatch.

Along with exploiting solar power, such a device could harvest energy from the motion of walking, the wind blowing or a moving car. *Nature Energy* <http://dx.doi.org/10.1038/nenergy.2016.138> (2016)

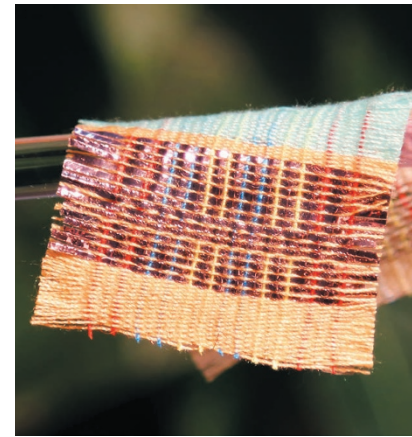
## CONSERVATION

## Hawaiian bird-life collapse

Populations of native birds on the Hawaiian island of Kauai have declined drastically in the face of climate change.

Eben Paxton, of the US Geological Survey's Pacific Island Ecosystems Research Center in Hawaii, and his colleagues analysed data on seven native species of forest bird on Kauai. Between 2000 and 2012, populations of six of these (including *Drepanis coccinea*; pictured) shrank by an average of 68% in their core range in the island's interior, and by an average of 94% in the surrounding areas. Two of these species could be detected only in the interior region in 2012 surveys.

The main driving force behind these declines



is probably increased temperatures that have allowed the spread of avian malaria, the authors say. They add that native birds are likely to go extinct in the next few decades at the current rates of decline. *Sci. Adv.* 2, e1600029 (2016)

## CANCER BIOLOGY

## Location matters in cancer growth

A tumour's genetic mutations often dictate which metabolic pathways it uses for rapid growth, but the tissue it develops from can also be an important factor.

Matthew Vander Heiden at the Massachusetts Institute of Technology in Cambridge and his colleagues studied tumours that bore mutations in two genes — *Kras* and *Trp53* — and that grew in either the lung or the pancreas in mice. They found that lung tumours tended to incorporate certain amino acids into proteins, and to use these amino acids as a source of nitrogen. But in the pancreas, the tumours relied less heavily on metabolizing the amino acids than the lung tumours did.

Personalized treatments for cancer should take into account both a tumour's genetics and its location, the authors say. *Science* 353, 1161–1165 (2016)

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