

RESEARCH HIGHLIGHTS

Selections from the
scientific literature

ANIMAL BEHAVIOUR

How termites drum up help

To call for assistance when their nest is under attack, some termites use their heads.

Wolfgang Kirchner and Felix Hager of Ruhr University in Bochum, Germany, mimicked predator attacks on two species of African termites that grow fungi in long underground galleries connected to their nests. Specialized soldier termites responded by drumming their heads against the ground, which drew more soldiers to the alarm. Laboratory experiments confirmed that soldiers sense the low-frequency vibrations.

Vibrations from simulated drumming dissipated within 40 centimetres, but many galleries are much longer. To transmit alarm calls over greater distances, the termites pass signals on to others until the messages reach soldiers, the researchers suggest.

J. Exp. Biol. 216, 3249–3256 (2013)

ECOLOGY

Soil life predicts nutrient flow

Studies of soil organisms are usually lab-based, but in a rare field study, Franciska de Vries — now at Lancaster University, UK — and her colleagues looked at the relationship between soil food webs and carbon and nitrogen entering and leaving controlled areas. The 60 sites — in Sweden, the United Kingdom, the Czech Republic and Greece — included grassland, intensely farmed sites and areas with crop rotation.

Intensive land use, such as wheat cultivation, reduced the mass of soil life of all kinds.



JULIE DERMANSKY/CORBIS

CLIMATE SCIENCES

Global heat waves on the rise

Heat waves will become more common by 2040. Climate models used by Dim Coumou of the Potsdam Institute for Climate Impact Research in Germany and Alexander Robinson at the Complutense University of Madrid predict that about 20% of Earth's land surface will experience monthly temperatures that are more than three standard deviations from the mean. Such extremes occur over about 5% of the global land surface today, and were seen in

the 2012 heat wave across the United States and in the Texan heat wave of 2011, when reservoirs nearly dried up (pictured).

The heat-wave projections stand until 2040, no matter how much more carbon dioxide humans put into the air. After that, lowered emissions could allow temperatures to stabilize, whereas maintaining current emissions would see the frequency of heat waves continue to rise. *Environ. Res. Lett.* 8, 034018 (2013)

But the researchers found that biomass within soil was a better predictor of nutrient cycling and soil health than was land usage, and suggest that nutrient models should pay more attention to what happens underground.

Proc. Natl Acad. Sci. USA
<http://dx.doi.org/10.1073/pnas.1305198110> (2013)

CANCER IMAGING

Chemical reaction reveals tumours

A chemical-imaging technique may one day allow tracking of prostate cancer without the

need for invasive biopsies.

A team led by Sarah Nelson at the University of California, San Francisco, exploited differences in how healthy and cancer cells break down certain chemicals, using them to spot tumours in 31 human patients.

The researchers used magnetic resonance imaging to observe isotopically labelled pyruvate, a compound that supplies energy to cells. Shortly after injecting the labelled pyruvate into patients, researchers could observe it being converted into lactate in prostate tumours, and the conversion sometimes revealed cancer in regions that had been

overlooked by conventional imaging. Signals that were more intense indicated faster metabolism of pyruvate, a property that has been linked in animal studies to more-aggressive forms of cancer. *Sci. Transl. Med.* 5, 198ra108 (2013)

MATERIALS

Catalyst forms under pressure

High pressure normally turns the porous minerals known as zeolites into a powdery, non-crystalline mess. Chemists have now shown that this is not

always the case, by converting a zeolite into a stable new mineral using high-pressure compression.

Zeolites are often used as catalysts because their pores can trap a range of molecules. Depending on zeolite structure, the minerals can break up heavy oil, separate out gases or purify water.

In the hunt for fresh zeolite structures, Avelino Corma at the Polytechnic University of Valencia, Spain, and his co-workers used diamond anvils to compress the minerals. At 32,000 times atmospheric pressure, a type of silica zeolite transformed irreversibly into another porous structure, which was better at separating propene and propane than its parent form.

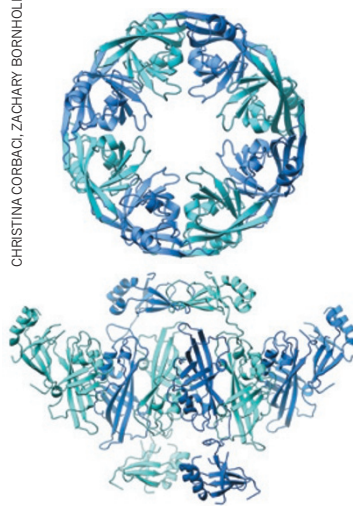
Angew. Chem. <http://dx.doi.org/10.1002/anie.201305230> (2013)

STRUCTURAL BIOLOGY

Lethal viral shape-shifter

An ebolavirus protein adopts drastically different conformations (**pictured**) throughout its life cycle, allowing the deadly virus to do more with fewer genes.

Ebolaviruses kill up to 90% of the people they infect. Erica Ollmann Saphire of the Scripps Research Institute in La Jolla, California, and her colleagues used crystallography, biochemistry and microscopy to track the structure of VP40, a protein that controls ebolavirus



THOMAS DAHLGREN, ADRIAN GLOVER

CHRISTINA CORBACI, ZACHARY BORNHOLDT, ERICA OLLMANN SAPHIRE/TSRI

assembly and exit from host cells. They learned that the protein does not travel alone as previously thought, but moves to the cell membrane in butterfly-shaped pairs, which then align end-to-end into hexamers that form filaments essential for viral assembly and release. The team also analysed requirements for VP40 to form yet another structure, a previously observed ring that binds to RNA and regulates viral genes in infected cells. **Cell** 154, 763–774 (2013)

CANCER BIOLOGY

Mouth microbe causes cancer

Certain bacteria living in the mouth and gut can invade intestinal cells and trigger changes that lead to colorectal cancer.

A team led by Wendy Garrett at the Harvard School of Public Health in Boston, Massachusetts, found that the bacterium *Fusobacterium nucleatum* induced colonic tumours in genetically susceptible mice.

Separately, Yiping Han at Case Western Reserve University in Cleveland, Ohio, and her colleagues showed that FadA, an adhesion molecule produced by *F. nucleatum*, interacts with a counterpart on mammalian cells and triggers proliferation of colorectal-cancer cells. Colon tissue from patients with tumours had 100 times more copies of the gene encoding FadA than did tissue from healthy individuals. **Cell Host Microbe** 14, 195–206; 207–215 (2013)

PSYCHIATRIC GENETICS

Common variants behind disorders

The risk of getting a psychiatric illness is largely heritable — and many of the genetic variants involved seem to be shared across disorders.

The international Cross-Disorder Group of the Psychiatric Genomics Consortium identified

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NEUROSCIENCE

Commitment beats will

HIGHLY READ
on www.cell.com
in August

Avoiding temptation is more effective than resisting it.

Molly Crockett, now at University College London, and her colleagues tested 78 men as they relied on willpower (resisting an available temptation) or precommitment (voluntarily restricting access to temptation) to obtain rewards.

After rating a set of erotic images, subjects could choose to view a less-enjoyable image immediately or a more-enjoyable one after a delay. In willpower tasks, the option to see the less-preferred image was always available, whereas in precommitment tasks, men chose at the outset whether to wait for a preferred image. Participants were more likely to gain the superior reward in precommitment scenarios, with the benefits of precommitment varying across individuals. Imaging of a subset of 20 men revealed that different brain areas were used for precommitment and willpower.

Neuron 79, 391–401 (2013)

common genetic variants in more than 30,000 patients diagnosed with one of five psychiatric disorders, and compared these with thousands of non-diagnosed controls.

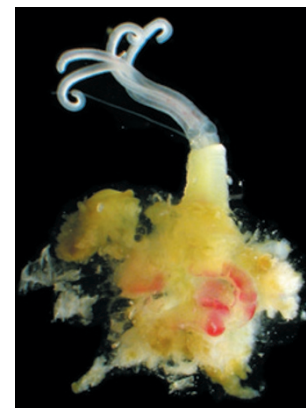
These variants accounted for 17–29% of risk for the illnesses, and there is substantial overlap between disorders. For example, in schizophrenia, 15% of the variants overlapped with bipolar disorder, 9% with depression and 3% with autism. **Nature Genet.** <http://dx.doi.org/10.1038/ng.2711> (2013)

ZOOLOGY

Bone-eating worms in icy seas

Two species of bone-devouring worms have been discovered in the cold waters of the Antarctic. Other members of this genus had previously been found only at warmer latitudes.

Scientists led by Thomas Dahlgren at the company Uni Research in Bergen, Norway, found a new species of worm (*Osedax antarcticus*; **pictured**) carpeting whale bones that the team had placed on the sea floor. Another *Osedax* species was found on bones left in



shallower water.

Pine and oak planks placed with the bones remained in near-pristine condition, free of the marine invertebrates that usually feed on wood in warmer waters and quickly consume sunken ships. As a result, the researchers suggest that shipwrecks on the cold sea floor will stay remarkably well-preserved.

Proc. R. Soc. B 280, 20131390 (2013)

For a longer story on this research, see go.nature.com/kb2kix

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