RESEARCH HIGHLIGHTS

Selections from the scientific literature

EVOLUTION

Early life liked it hot

The last universal common ancestor of all life — a microbe dubbed LUCA that existed around 3.5 billion years ago — probably resided in a hydrothermal vent that had low oxygen levels.

To find out how the organism lived, William Martin and his colleagues at Heinrich Heine University Düsseldorf in Germany reconstructed the evolutionary trees of more than 6 million genes from bacteria and archaea. They identified 355 protein families that were probably in LUCA's genome — these are involved in anaerobic metabolism and fixing carbon dioxide and nitrogen. This suggests that LUCA lived in an environment that was rich in hydrogen, CO_2 and iron, such as a hydrothermal vent.

LUCA may have depended heavily on the geochemistry of the vent to survive.

Nature Microbiol. **http://doi.org/bm2s (2016)**

CLAIRE N. SPOTTISWOODE

BEHAVIOURAL ECOLOGY

Bird helps people to find honey

A bird species responds to the specialized calls of human honey hunters, then leads them to bees' nests.

The greater honeyguide (*Indicator indicator*, **pictured** with honey hunter) benefits by eating the beeswax left behind by hunters after they break open bees' nests to get the honey. Claire Spottiswoode at the University of Cambridge, UK, and her colleagues found that 75% of nests located by honey hunters in Niassa National Reserve, Mozambique, were found with the help of the bird. Playing recordings of a traditional trill-grunt call made by the local Yao people while hunting doubled the chances of attracting a honeyguide to 66%, compared with recordings of other human or animal sounds. Overall, the call tripled the chances of finding a bees' nest to 54%.

The ability to understand and respond to human calls is not restricted to domesticated animals, the authors say.

Science **353, 387–389 (2016)**

CHEMISTRY

'Molecules' made from superatoms

Chemists have built structures similar to molecules but made up of superatoms — clusters of atoms with some of the same properties as atoms.

To make superatom 'molecules', Xavier Roy and his colleagues at Columbia University in New York City created cobalt–selenium clusters. They then attached two or three clusters to one another with 'arms' comprising various elements.

The team hopes that the technique can be used to make materials with tailored properties such as heat conduction or the ability to store information magnetically.

Nano Lett. **http://doi.org/bmw5 (2016)**

PLANETARY SCIENCE

Revived telescope finds 104 planets

Astronomers have spied 104 new worlds in the Milky Way using NASA's Kepler Space Telescope.

Part of Kepler broke down in 2013, but engineers managed to repair it and send it on a fresh mission, dubbed K2. This latest discovery, from Ian Crossfield at the University of Arizona in Tucson and an international team, is the biggest so far for the K2 mission. The team reports numerous planetary candidates, and confirmed more than 100 as exoplanets using additional observations from ground-based telescopes. They found that the majority of planets are smaller than Neptune, and probably have thick atmospheres and rocky cores. Nearly 40 have a radius that is about twice that of Earth or smaller, and 4 of those orbit the same red dwarf star.

Two of the planets orbiting the red dwarf could have irradiation levels that are similar to Earth's, making life on those planets a possibility, according to the authors.

Astrophys. J. Suppl. Ser. **(in the press); preprint at http://arxiv.org/abs/1607.05263 (2016)**

NEURODEGENERATION

How immune cells clear amyloid

Three key proteins allow immune cells in the brain to clear out a protein called

DANIEL J COX/GETTY

amyloid-β, which is a hallmark of Alzheimer's disease.

The immune cells, called microglia, normally absorb and digest amyloid-β after lipoproteins called APOE and CLU attach to it. Lino Gonzalez and Morgan Sheng of drug firm Genentech in South San Francisco, California, and their colleagues looked for interactions between human proteins, and found that a receptor on microglia called TREM2 binds to APOE and CLU. Mouse microglia lacking Trem2 were less effective at absorbing amyloid–lipoprotein complexes, and digested them more slowly than normal cells did. Microglia taken from people carrying a TREM2 mutation were also less able to take up the complexes.

Mutations in the genes that encode TREM2, APOE and CLU have been linked to Alzheimer's, and so the results show how these different genetic risk factors could be linked.

Neuron 91, **328–340 (2016)**

PALAEOCLIMATE

Analysing ancient air in salt crystals

Gas trapped in ancient bubbles reveals that Earth's atmosphere was rich in oxygen up to 200 million years earlier than models have predicted, well before animal diversity exploded.

Bubbles in salt crystals called halites (**pictured**) that formed millions of years ago can provide clues to ancient climates. Nigel Blamey of Brock University in St Catharines, Ontario, Canada, and his colleagues studied pockets of air inside 815-million-year-old halites from southwest Australia. The air contained nearly 11% oxygen, more than expected for that time period.

The authors suggest that high oxygen levels drove animal evolution, rather than the other way around.

Geology **http://doi.org/bmt3 (2016)**

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OPTICS

Human eye sees single photons

People can perceive flashes of light as feeble as a single photon.

Alipasha Vaziri at the Rockefeller University in New York City and his colleagues asked three volunteers to stare into an optical system in the dark and listen to two sounds, one of which was sometimes accompanied by the emission of a photon. During more than 30,000 trials, the participants correctly identified a photon more frequently than would be expected if they had guessed at random.

Going forwards, the team plans to test how the human visual system responds to photons in various quantum states.

Nature Commun. 7, **12172 (2016)**

For more on this story, see go.nature.com/2anfrrf

MARINE ECOLOGY

Ice algae key to Arctic food web

Even creatures living many metres below the Arctic Ocean's surface rely on algae that grow in sea ice and so, like those living near the surface, may feel the negative effects of shrinking ice.

A team led by Doreen Kohlbach of the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research in Bremerhaven, Germany, collected small

crustaceans and other animals at different depths in the central Arctic Ocean and analysed their fatty-acid content to identify the source of carbon in their diets. Organisms living at the water–ice interface (such as *Apherusa glacialis*; **pictured**) got as much as 92% of their carbon from the ice algae. But creatures sampled at up to 50 metres below the surface got 14–55% of their carbon from the algae.

Melting sea ice means a shrinking habitat for algae, which could lead to decreased nourishment for the entire Arctic food web.

Limnol. Oceanogr. **http://doi.org/bmtq (2016)**

NEUROSCIENCE

Neurons compete to make memories

Memories that are formed within a few hours of one another can be encoded by a shared set of neurons.

Sheena Josselyn and Paul Frankland at the Hospital for Sick Children in Toronto, Canada, and their colleagues exposed mice to two fear-inducing experiences, each consisting of a different musical tone paired with a mild electric shock to the foot. When the events occurred within 6 hours of each other, the associated memories were encoded by some of the same neurons in the lateral amygdala — a brain area involved in fear memory. However, fear memories separated by 24 hours were encoded by separate groups of neurons.

The researchers found that neurons stimulated by the first experience transiently suppressed the excitability of neighbouring neurons, increasing the chances that the same cells will respond to a second experience that follows soon afterwards.

Science 353, **383–387 (2016)**

ENERGY

Carbon capture makes electricity

A battery developed from widely available materials produces electricity by capturing carbon dioxide from gas mixtures.

Wajdi Al Sadat and Lynden Archer at Cornell University in Ithaca, New York, designed an aluminium-based electrochemical cell. At the cell's cathode, oxygen is reduced to form a superoxide, which then binds CO_2 and combines with aluminium from the anode to form aluminium oxalate.

The authors estimate that for each kilogram of aluminium, more than 9 kilograms of CO_2 can be captured from flue gas and transformed to generate 3.6 kilowatt-hours of electricity. This offers a strategy to reduce CO_2 emissions while producing power.

Sci. Adv. 2, **e1600968 (2016)**