

RESEARCH HIGHLIGHTS

Selections from the scientific literature

ECOLOGY

Salt water fuels nitrogen release

Saltwater incursions into coastal wetlands can increase the release of ammonium into the ocean, complicating coastal management in the face of human development, climate change and rising sea levels.

Marcelo Ardón at East Carolina University in Greenville, North Carolina, and his colleagues analysed the impact of increased saltwater levels on natural and restored wetlands in North Carolina during four droughts from 2007 to 2012. Reduced processing of ammonium by soil microbes and less nitrogen uptake by plants contributed to ammonium runoff, but releases were higher in restored wetlands, probably due to residual nutrients from fertilizer use.

The researchers suggest that the potential for saltwater-induced nitrogen release should be assessed during the development of large coastal wetland-restoration projects. *Glob. Change Biol.* <http://dx.doi.org/10.1111/gcb.12287> (2013)

ASTROPHYSICS

Magnetic energy of supernovae

Light from five super-luminous supernovae has revealed an unusual power source behind these cosmic explosions, which were 5 to 100 times brighter than regular supernovae.

Cosimo Inserra at Queen's University Belfast, UK, and his team monitored five nearby supernovae for up to a year each. They report that the persistent glow of these flare-ups spotted by the Panoramic Survey Telescope and Rapid Response System in Maui, Hawaii, is too bright

to be generated by radioactive nickel, the fuel of conventional supernovae. However, both the peak luminosity and the long tail of the light are consistent with stars collapsing to form magnetars — rapidly spinning neutron stars with powerful magnetic fields — that provide an additional reservoir of energy for the supernova. This is the strongest observational evidence so far for this supernova mechanism, the researchers say. *Astrophys. J.* 770, 128 (2013)

CLIMATE CHANGE

Acidic waters do not toughen corals

Even corals that have spent generations in acidic waters have failed to adapt completely to these harsh conditions.

As atmospheric levels of carbon dioxide increase, the world's oceans are becoming more acidic, with potentially serious consequences for animals that have carbonate skeletons and shells. Adina

Paytan at the University of California, Santa Cruz, and her colleagues collected samples from seven colonies of *Porites astreoides* coral that live in the seas off the Yucatan Peninsula in southeastern Mexico, where groundwater springs have produced low-pH conditions for thousands of years. These corals had lower growth rates and experienced higher predation by boring organisms than seven samples of the coral living just beyond the influence of springs. Despite



EVOLUTION

Diving is in the blood

Diving mammals ranging from water shrews, beavers and seals to ancient whales (pictured clockwise from top left) share adaptations in the protein that stores oxygen in muscles.

A team led by Michael Berenbrink at the University of Liverpool, UK, analysed the myoglobin proteins of extant mammals, and from this inferred the sequences of these proteins in the mammals' extinct relatives. Compared with non-divers, long-diving creatures tended to have higher levels of myoglobin in their muscles and these proteins

were more highly charged, which probably prevents them from sticking together and reducing their utility. On the basis of this relationship, the team developed a model to estimate how long ancient animals could have stayed underwater. They calculated that after ancestors of whales moved from land to water in the Eocene, 56 million to 34 million years ago, their diving capacity increased from 1.6 to 17.4 minutes.

Science <http://dx.doi.org/10.1126/science.1234192> (2013)

living in low-pH areas, these reef-forming organisms will not fully adapt to the ocean acidification conditions expected by 2100, say the authors.

Proc. Natl Acad. Sci. USA
<http://dx.doi.org/10.1073/pnas.1301589110> (2013)

BIOLOGY

A fluorescent protein from eels

Muscle fibres of the Japanese freshwater eel (*Anguilla japonica*) produce a fluorescent protein, the first to be identified in a vertebrate.

Atsushi Miyawaki and his colleagues at the RIKEN Institute in Wako, Japan, identified the gene that encodes the protein and named it *UnaG*, after unagi, the Japanese word for this eel. When expressed in mammalian cells, the protein produced green fluorescence. *UnaG* is inactive until it binds to the naturally occurring small molecule bilirubin, a breakdown product of haemoglobin. The team showed that *UnaG* can be used to measure bilirubin in human serum. It might also be useful as a laboratory tool alongside other widely used fluorescent proteins.

Cell <http://dx.doi.org/10.1016/j.cell.2013.05.038> (2013)
For a longer story on this research, see go.nature.com/fljtrl

ANIMAL BEHAVIOUR

Turtle tots chase warm spots

Cold-blooded turtles move towards the most comfortable climes, even while they are still embryos.

Wei-Guo Du at the Chinese Academy of Sciences in Beijing

and his colleagues heated the ends or sides of recently laid eggs of the Chinese pond turtle (*Chinemys reevesii*, pictured) for a week and measured the movements of the embryos by shining light through the shells. Embryos moved towards spots maintained at a balmy 29°C or 30°C, but shifted away from spots heated to a dangerously hot 33°C. Only living embryos changed position, suggesting that the motion was due to the animals rather than to changes of viscosity in egg fluids.

Although reptile embryos are generally thought to lack control over their environment, turtles inside eggs behave much like adults to regulate body temperatures, the authors say. *Biol. Lett.* 9, 20130337 (2013)
For a longer story on this research see go.nature.com/8ixxah

MARINE SCIENCE

Marine dumping detailed

Humans are dumping far more litter in the ocean than was once thought.

Kyra Schlining at the Monterey Bay Aquarium Research Institute in Moss Landing, California, and her team used a database of characterized observations from 22 years of research-submersible missions in Monterey Bay to identify anthropogenic marine debris. The litter was seen in 1.49% of the surveyed area, was mainly metal and plastic, ranged in type and depth from a PVC pipe at 25 metres to a plastic bag at 3,971 metres, and was especially prevalent around the submarine Monterey Canyon. Most of the metal and plastic debris was seen below depths of 2,000 metres, suggesting that earlier studies may have underestimated the impact of detritus on deep regions, which are generally poorly observed. Submarine canyons may have trapped and funnelled the debris to depth, the authors suggest.

Deep-Sea Res. I <http://dx.doi.org/10.1016/j.dsr.2013.05.006> (2013)

COMMUNITY CHOICE

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CHEMISTRY

Catalyst targets spot on carbon ring

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in May

A metal catalyst makes sure that molecules join at the correct region of a carbon ring, disrupting the same bond every time.

Chemists have made strides in identifying reactions that disrupt notoriously unreactive carbon-hydrogen bonds, which is a key step when attaching molecules to carbon-ring structures. But it is still challenging to ensure that a molecule joins at the correct region of a ring. Frank Glorius and his colleagues at the University of Münster in Germany have solved this problem for a recalcitrant region on a class of rings known as benzo[*b*]thiophenes. Using palladium on a carbon support, together with copper chloride, the authors developed a catalyst with more than 99% selectivity for the desired hydrogen atom in many cases. The reaction is quite cheap, and withstands air and water.

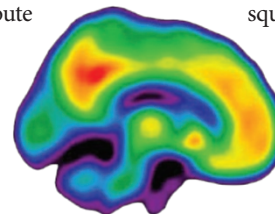
J. Am. Chem. Soc. 135, 7450–7453 (2013)

NEUROBIOLOGY

Mutations alter brain amyloid

Some mutations that boost the risk of Alzheimer's may also increase production of a form of amyloid- β , a peptide that is thought to contribute to the disease.

People who inherit specific mutations of the genes *PSEN1* or *PSEN2* nearly always develop a rare form of Alzheimer's disease. Randall Bateman and his team at the Washington University in St. Louis, Missouri, used stable isotope labelling and positron emission tomography to track production of amyloid- β in the brains (pictured) of 11 patients who carry *PSEN* mutations and 12 of their siblings who do not. Those with the mutation produced a long form of the peptide, called amyloid- β 42, at a rate 18% higher on average than those without the mutation. Amyloid- β 42 is the main component of amyloid plaques, which are found in the brains of patients with Alzheimer's. *Sci. Transl. Med.* 5, 189ra77 (2013)



PALAEOONTOLOGY

Early animals' revealing tracks

Fossilized trails left in 560-million-year-old Canadian rocks may be some of the earliest evidence of squirming animals. Latha Menon at the University of Oxford, UK, and her team studied the disk-shaped impressions left by

an organism called *Aspidella* in what was once shallow water in Newfoundland. The authors identified previously overlooked horizontal and vertical rock trails that seemed to be linked with *Aspidella*. They suggest that the marks were made as the animals wormed their way out of sediment, rather than as they passively slid. *Aspidella*, and perhaps other Ediacarans, were probably early animals living underwater, the authors say.

Geology <http://dx.doi.org/10.1130/G34424.1> (2013)

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