RESEARCH HIGHLIGHTS

Selections from the scientific literature

NEUROSCIENCE

Carbon dating spots new neurons

Human cells renew themselves in the striatum, a brain region involved in cognition and coordinating body movements.

Neurons are known to regenerate in the human adult hippocampus. To find out whether regeneration occurs in other areas, Jonas Frisén at the Karolinska Institute in Stockholm and his colleagues developed a carbon-14 dating technique. They compared levels of the isotope in DNA extracted from different areas of post-mortem brains with levels of atmospheric carbon-14 during the birth year and lifetime of the donors. The team found that the carbon-14 levels in the striatum matched atmospheric levels present after the birth of the donors, suggesting that new neurons in this brain region were generated post-natally.

Only a type of neuron called an interneuron seems to regenerate in the striatum.

Cell **http://dx.doi.org/10.1016/j.cell.2014.01.044 (2014)**

BANFF WILDLIFE CROSSINGS PROJECT

CONSERVATION BIOLOGY

Bears use animal bridges to breed

Animal crossings in Canada's Banff National Park allow bears to cross a major highway to breed, preventing genetic isolation.

Roads can fragment animal populations, increasing the risk of inbreeding and extinction. Bridges (pictured) and underpasses could help, but it has not been clear how well they work. Michael Sawaya and his colleagues at Montana State University in Bozeman studied grizzly bears (*Ursus arctos*) and black bears (*Ursus americanus*) that used 20 animal crossings along a 45-kilometre stretch of highway bisecting the park. The researchers snared fur samples from passing bears, using barbed wire and other devices, for DNA analysis.

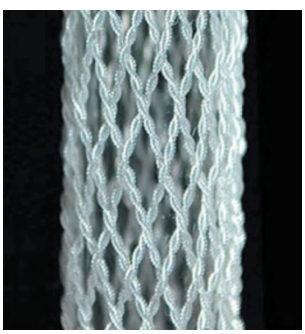
Genetic data from bears using the crossings and those in the greater park area revealed a healthy amount of genetic exchange between populations on either side of the road.

Proc. R. Soc. B 281, **20131705 (2014)**

MATERIALS

Muscles made from thread

Twisting strong fibres such as sewing thread and fishing line produces artificial 'muscles' that are stronger than their human counterparts.



People have long made yarn by twisting fibres. But Ray Baughman at the University of Texas at Dallas in Richardson and his team twisted low-cost nylon or polyethylene fibres so tightly, while applying just the right amount of weight, that the fibres became extremely coiled muscles. The researchers could then weave the muscles into braids (**pictured**) or textiles. A bundle of polyethylene muscle fibres generated mechanical work that was more than 100 times greater than that produced from the same weight of human muscle.

The artificial muscles could one day be used in robotics, prosthetic devices, and even in clothing with pores that open and close in response to temperature changes.

Science 343, **868–872 (2014)**

ARCHAEOLOGY

Ancient artists' gender is a mystery

Efforts to infer the sex of ancient hand-painting artists by comparing their prints with those of modern humans could be flawed, according to a team in the Czech Republic.

Patrik Galeta and his colleagues at the University of West Bohemia in Pilsen studied the handprints of 50 modern men and 50 modern women from France. An analysis of data, including the length of the hand and fingers, correctly identified the sex to which the print belonged in 92% of cases, but only 54% could be classified with 95% certainty. When the authors used a method previously developed using US handprints, 100% of French female prints were successfully classified, compared with only 58% of those belonging to French males; this discrepancy is mainly due to differences in hand size between the US and French populations.

Modern measurements cannot be generalized across populations, casting doubt

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on the ability of these methods to accurately assign sex to handprints made by long deceased humans, the authors say.
J. Arch. Sci. **http://doi.org/rmr (2014)**

ZOOLOGY

Farming shifts bird reproduction

Exposure to agricultural habitat early in life seems to speed up the reproductive schedule of a tropical bird species.

Samantha Cartwright at the University of Reading, UK, and her colleagues looked at 23 years of life-history data for 79 female Mauritius kestrels (*Falco punctatus*; **pictured**), a threatened, forest-dwelling bird. The authors found that birds born in nests near agricultural areas had lower survival rates as young adults, but also bred earlier in life, compared with birds born in forested habitats.

This reproductive shift could be an adaptive response to nutritional stress in early life that foreshadows a harsh or unpredictable adult life, the authors suggest.
Curr. Biol. **http://doi.org/rnc (2014)**

JOHN A. ROGERS/UNIV. ILLINOIS

REGENERATIVE BIOLOGY

Altered proteins boost healing

Adding a protein 'tail' to molecules that drive cell replication and tissue repair could improve wound-healing treatments.

Most growth factors used in the clinic do not stimulate healing well in humans, possibly because they do not bind tightly to the proteins that make up the matrix between cells. Jeffrey Hubbell at the Swiss Federal Institute of Technology in Lausanne and his colleagues discovered that one growth factor, PlGF-2, has an amino-acid tail that lets the protein bind to the extracellular matrix. The team added this tail to other growth factors, including BMP-2, which stimulates bone growth. When the team used these modified molecules to treat mice with skin wounds or bone defects, the injuries healed much more quickly than those treated with unmodified growth factors.
Science 343, **885–888 (2014)**

VISION

Molecule makes blind mice see light

A chemical injected into the eyes of blind mice restores the animals' sensitivity to daylight.

Richard Kramer at the University of California, Berkeley, and his colleagues tested a small synthetic molecule called DENAQ, which interacts with retinal ganglion cells and changes shape when exposed to white light of moderate intensity. In mice missing the light-sensing rod and cone cells in the retina and treated with DENAQ, light altered the interaction between the chemical and retinal ganglion cells so that the cells, which normally do not respond to light, became responsive. These animals were also more active when exposed to light.

The chemical works for several days, and only in retinas with degenerated rods and cones. DENAQ could be a possible drug candidate for the treatment of blinding diseases such as age-related macular degeneration, the authors say.
Neuron 81, **800–813 (2014)**

CLIMATE CHANGE

Permafrost grows thanks to plants

Despite rising temperatures in the Arctic, permafrost has been expanding around some lakes, probably because of vegetation springing up nearby.

Twelvemile Lake in Alaska has been shrinking, causing permafrost and willow-shrub growth to expand along its shores. A team led by Martin Briggs of the US Geological Survey in Storrs, Connecticut, modelled the response of ground ice to shading and transpiration by plants. The simulations show that, thanks to the effects of vegetation (for example, by cooling and drying the surface), shallow permafrost can persist and even expand in warmer temperatures.

However, the team calculates that, within 70 years, rising air temperatures will win out and cause this permafrost to thaw.
Geophys. Res. Lett. **http://doi.org/rmp (2014)**

COMMUNITY CHOICE

The most viewed papers in science

GEOLOGY

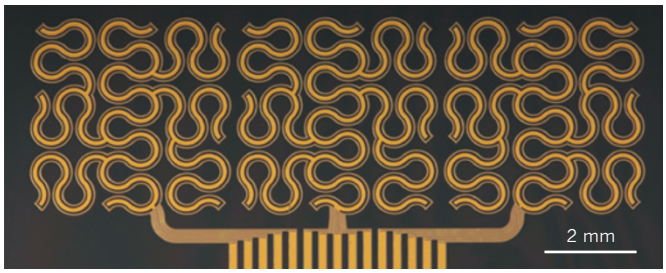
Plate tectonics got an early start

HIGHLY READ on geology.gsapubs.org in January

Plates of Earth's crust could have been sliding beneath one another (or subducting) as far back as 4.4 billion years ago — soon after the planet's crust formed.

Previous studies have estimated that subduction started anywhere between roughly 1 billion and 4 billion years ago. Simon Turner at Macquarie University in Sydney, Australia, and his colleagues studied rocks in northern Quebec, Canada, that are up to 4.4 billion years old. Trace elements in the rocks and the sequence in which the rocks are layered strongly resemble those formed along a modern-day subduction zone south of Japan, called the Izu-Bonin-Mariana arc.

The geochemical similarities suggest that the Canadian rocks were formed in a subduction environment, the authors say. They add that chemical reactions in deep-diving crustal slabs could have generated the organic molecules that fuelled the development of early organisms.
Geology 42, **139–142 (2014)**



MATERIALS

Patterns make circuits stretchy

Laying wires in fractal patterns could improve stretchable electronics.

Devices such as wearable sensors require circuits that can withstand stretching. A team led by John Rogers at the University of Illinois at Urbana-Champaign bonded wires in fractal motifs to elastic materials (**pictured**). Fractals are complex patterns that, when divided into smaller parts, look the same as they do when whole. The authors showed that their devices were more stretchable than those that had repeating loop and S-shaped patterns, with certain fractal designs allowing for stretching in specific directions.

The authors say that such structures could be used in sensors worn on the skin or radio antennas that can be mechanically tuned.
Nature Commun. 5, **3266 (2014)**

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