

RESEARCH HIGHLIGHTS

Selections from the scientific literature

MICROBIOLOGY

Obesity link to jet-lagged microbes

Disrupted sleep patterns alter the composition of gut bacteria, leading to metabolic problems.

Eran Elinav at the Weizmann Institute of Science in Rehovot, Israel, and his team found that the abundance of gut microbes in mice fluctuates daily in sync with host feeding times. But when the team genetically disabled the animals' circadian clocks or shifted them by eight hours, the bacteria lost this rhythmicity and their composition changed.

Jet-lagged mice eating a high-fat diet gained more weight and showed an increased susceptibility to diabetes compared with normal mice that were fed the same food. Jet-lagged humans had more bacteria called Firmicutes — which have been linked to metabolic disease — in their guts than before their transatlantic trips.

The findings could explain why shift workers have a higher risk of obesity and diabetes.

Cell <http://doi.org/wfh> (2014)

CONSERVATION

Horn trade could save rhinos

Wild southern white rhinoceroses could go extinct in just nine years because of poaching, but could be saved if trade in their horns were to be carefully managed.

Poachers killed almost 1,000



southern white rhinoceroses (*Ceratotherium simum simum*; pictured) for their horns in 2013, some 5% of the total population. Enrico Di Minin of the University of Helsinki and his colleagues used population and economic models to estimate extinction risk and the cost of anti-poaching patrols.

The models suggest that the species could be saved by a carefully controlled trade in horn collected from rhinos that die naturally or harvested from live animals without killing them. Money from this would fund increased anti-poaching patrols and create an

income source for local people, deterring them from poaching. *Conserv. Biol.* <http://dx.doi.org/10.1111/cobi.12412> (2014)

STEM CELLS

Cell transplants enhance vision

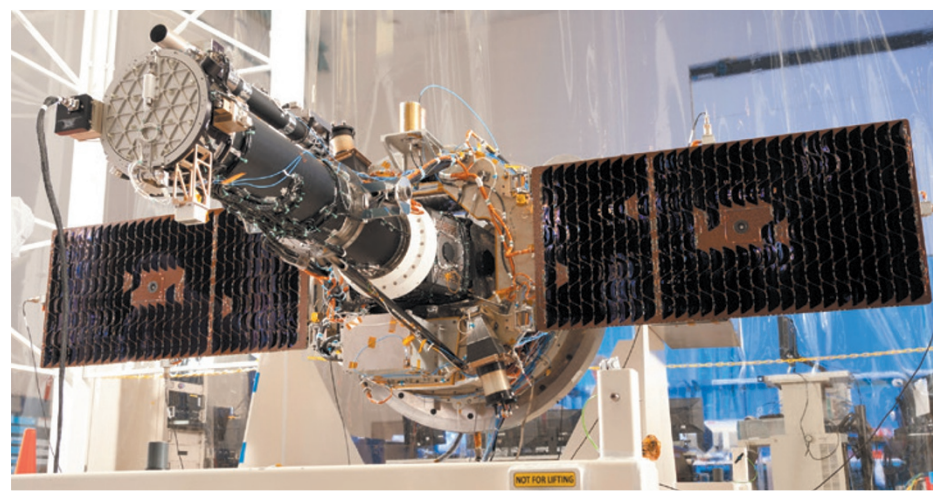
Implanted retinal cells derived from stem cells seem to be improving vision in some people in two early-stage clinical trials.

Steven Schwartz at the University of California, Los Angeles, Robert Lanza at Advanced Cell Technology in

Marlborough, Massachusetts, and their team grew retinal pigmented epithelial cells from human embryonic stem cells and transplanted them into the retinas of 18 people who have one of two forms of macular degeneration, which results in the loss of central vision.

After about two years, there have been no serious side effects from the cells, such as abnormal growth. Ten participants reported seeing more letters on an eye chart than before the treatment.

The transplanted cells are support cells that do not directly enable vision, so it is



SOLAR PHYSICS

Solar atmosphere is a hotbed of activity

Explosions of plasma in the Sun's atmosphere can reach temperatures of nearly 100,000°C, much hotter than scientists had expected.

The finding is one of several about the region between the solar surface and the uppermost edge of the Sun's atmosphere, or corona, revealed by NASA's Interface Region Imaging Spectrograph (IRIS) mission. The spacecraft (pictured before its launch) found that much of the energy from solar flares goes into heating and accelerating the plasma explosions, reports a team led by Hardi Peter of the Max Planck Institute for Solar System

Research in Göttingen, Germany.

Viggo Hansteen of the University of Oslo and his co-workers found short loops of magnetized plasma that flicker out within minutes and could help to explain how the corona gets so hot.

Jets of charged particles less than 300 kilometres wide also occasionally appear for up to 80 seconds, and may fuel the solar wind, say Hui Tian of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, and his colleagues.

Science <http://doi.org/wfc>; <http://doi.org/wfd>; <http://doi.org/wff> (2014)

LOCKHEED MARTIN

GARY OMBLER/DK LIMITED/CORBIS

not known how eyesight has improved. The authors could not rule out placebo and other bias effects.

Lancet <http://doi.org/wdf> (2014)

PHOTONICS

Laser moves items long distances

A laser beam can move matter tens of centimetres and in two directions.

Such tractor beams have been used to shift small objects very short distances. To scale this up, Wieslaw Krolikowski at the Australian National University in Canberra and his team fired a laser beam at gold-coated hollow glass spheres in air. The photons heated up the spheres, creating a temperature difference between their far and near surfaces. This generated a force that pushed the shells in the opposite direction to the beam. By changing the beam's polarization state, the team was able to stop the spheres or reverse their direction.

The authors say that the technique could be used to gather samples remotely and for other applications.

Nature Photonics <http://doi.org/wft> (2014)

METEOROLOGY

Tornadoes growing more clustered

Tornadoes in the United States have been happening on fewer days since the 1970s, but more tornadoes have touched down (pictured) on those days.

The overall number of US tornadoes has not changed in recent decades. However, in

analysing the national tornado database, Harold Brooks of the National Severe Storms Laboratory in Norman, Oklahoma, and his team found that the number of days with at least one tornado has fallen from 150 to 100 since the early 1970s. Over the past decade, 20% of US tornadoes occurred on just three days of the year.

Whether the change is linked to rising global temperatures is not clear, the authors say.

Science 346, 349–352 (2014)

NEUROSCIENCE

Molecule boosts brain rewiring

Blocking a brain-cell receptor boosts the brain's ability to form new neuronal connections as it adapts to changing stimuli.

Carla Shatz at Stanford University in California and her colleagues disrupted the receptor, PirB, in the visual centre of mouse brains by either genetically deleting it or blocking it with a molecule.

They found that when these mice were forced to use only one eye, circuits in their visual cortices were able to rewire better than those of normal mice. This happened even in adulthood, when brain-cell rewiring becomes more difficult. In a mouse model of amblyopia, or 'lazy eye', the blocking molecule made the brain sensitive to signals from the unused eye, allowing better vision in that eye.

Targeting PirB could be a way to treat amblyopia and other brain disorders, the authors say.

Sci. Transl. Med. 6, 258ra140 (2014)

PALAEOLOGY

Strange fossil is a vertebrate cousin

Bizarre 500-million-year-old sea creatures called vetulicolians are relatives of vertebrates.

Palaeontologists have struggled to identify the relationship between living animals and these extinct

SOCIAL SELECTION

Popular articles on social media

Pros and cons of the PhD glut

Amid increased competition for faculty jobs in biomedicine, some have suggested cutting the number of PhD students. So when a senior scientist advised against this, the online world took notice. Eve Marder, a neuroscientist at Brandeis University in Waltham, Massachusetts, argued in the journal *eLife* that it is hard to predict who will excel in science, so any attempt to limit access to PhD programmes will inevitably exclude potential stars. The reaction was mixed. "Reduce the number of admitted graduate students? Agree with Eve Marder: not the greatest idea," tweeted Sergey Kryazhimskiy, an evolutionary biologist at Harvard University in Cambridge, Massachusetts. But Mike White, a geneticist at Washington University School of Medicine in St. Louis, Missouri, argued in a blog post that Marder was "perpetuating the PhD pyramid scheme".

eLife 3, e04901 (2014)



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organisms, because of their odd combination of features such as gill slits and a segmented abdomen. A team led by Diego García-Bellido at the University of Adelaide and John Paterson at the University of New England in Armidale, both in Australia, analysed a fossil vetulicolian from a South Australian island.

The fossil, a new species named *Nesonektris aldridgei*, shows the outline of a notochord — a rod-like structure that develops into the backbone in vertebrates.

Although *N. aldridgei* is distantly related to vertebrates, its closest relatives are tunicates — invertebrates that swim or attach themselves to underwater rocks. It was probably a free-swimming filter-feeder, say the authors. *BMC Evol. Biol.* 14, 214 (2014)

CANCER

Immunotherapy beats leukaemia

Engineering certain immune cells to kill cancerous cells in leukaemia has driven the disease into remission for up

to two years in more than half of participants in an early-stage clinical trial.

Stephan Grupp at the Children's Hospital of Philadelphia, Pennsylvania, and his co-workers tested their approach on 30 people with acute lymphoblastic leukaemia, including 25 children, who had failed to respond to conventional treatment or relapsed.

The team engineered a patient's T cells to express a receptor that targets the cancerous B cell, and infused the T cells back into the person. After one month, 27 people were in remission, and after up to 2 years, 78% survived — a much higher rate than with chemotherapy. Those in remission had high blood levels of the engineered T cells.

However, all of the participants had inflammatory side effects that required hospitalization.

N. Engl. J. Med. 371, 1507–1517 (2014)

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