

RESEARCH HIGHLIGHTS

Selections from the scientific literature

ASTRONOMY

Light direct from an alien world

Astronomers have spotted light reflected off a planet orbiting a distant sun, by teasing it out from the background starlight. The discovery allows direct calculations of the mass and other properties of the exoplanet, rather than inferring them using other methods.

Jorge Martins of the University of Porto in Portugal and his team used the HARPS instrument at the European Southern Observatory's La Silla facility in Chile to study 51 Pegasi b, which was the first ever exoplanet found around a Sun-like star. The team subtracted the starlight, leaving only the faint planetary spectrum. From this, they calculated the planet's mass to be about half that of Jupiter.

Detecting this reflected light from other exoplanets could allow astronomers to determine more characteristics than other techniques can.

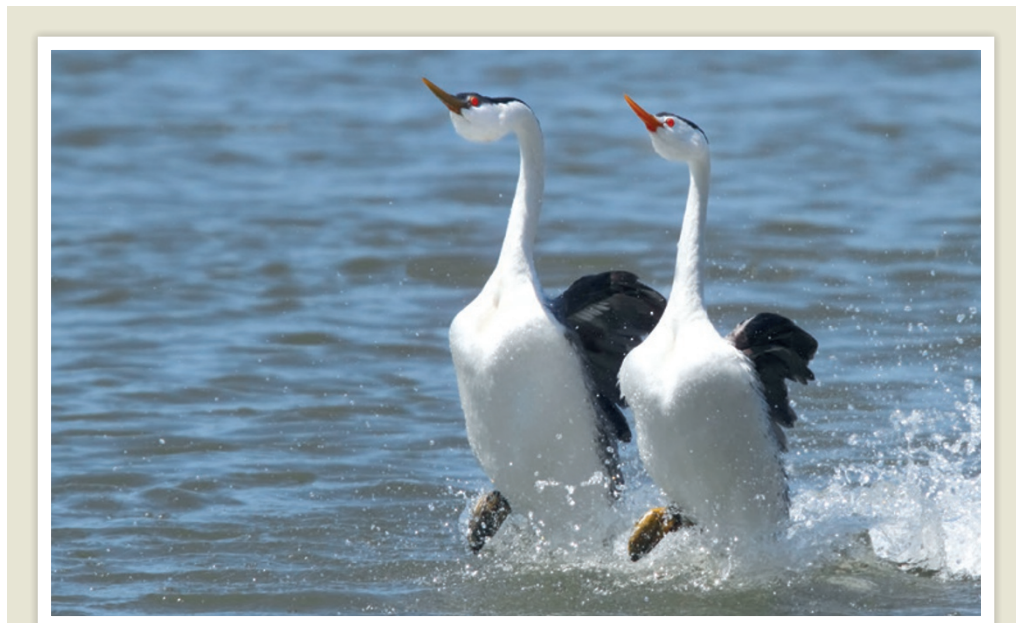
Astron. Astrophys. 576, A134 (2015)

BIOPHYSICS

Bacteria swim to form crystals

Fast-swimming bacteria that live at the bottom of salt marshes spontaneously come together to form organized crystalline structures that move through water.

The bacterium *Thiovulum majus* is a large, round cell with hundreds of small flagella, or tail-like structures, that spin to propel the organism. Alexander Petroff of the Rockefeller University in New York and his colleagues observed the behaviour of individually spinning cells under a microscope and found that each created tornado-like flows



SUSAN BISSELL

BIOMECHANICS

How grebes walk on water

The heaviest animals known to run on water pull off the feat by using quick strides and large feet that slap the surface.

Western and Clark's grebes (*Aechmophorus occidentalis* and *Aechmophorus clarkii*; pictured) run as far as 20 metres on water and for up to 7 seconds during a mating ritual, and are among only a few animals with this ability. Glenna Clifton at Harvard University's Concord Field Station in Bedford, Massachusetts, and her

team analysed high-speed video of wild birds performing the dance and studied models of the grebe foot in the laboratory.

They found that the birds stay above the water by having a fast stride rate of up to 20 steps a second, as well as wide, flat feet that slap the water surface with enough force to support up to 55% of the bird's weight. The animal's feet are also shaped to reduce drag.

J. Exp. Biol. 218, 1235–1243 (2015)

in the liquid around them. These forces cause the cells to self-assemble into groups of between 10 and 1,000 cells, arranged in a two-dimensional crystalline hexagonal shape that rotates collectively.

Phys. Rev. Lett. 114, 158102 (2015)

HYDROLOGY

Groundwater under Antarctica

A groundwater network found beneath an Antarctic valley could support microbial life.

Jill Mikucki of the University of Tennessee in Knoxville,

Slawek Tulaczyk at the University of California, Santa Cruz, and their colleagues studied Taylor Valley using an airborne instrument to measure underground electrical resistivity, which increases as water in soil freezes. The team discovered two systems of briny groundwater, one of which connects to the Ross Sea.

This water could be home to microbes, the authors suggest, because subsurface temperatures at boreholes were within the range that can support microbial life (−3°C to −20°C). And an outflow of

iron-containing subsurface saltwater from the Taylor Glacier is known to contain microorganisms.

Nature Commun 6, 6831 (2015)

NEUROSCIENCE

Brain waves go far in tinnitus

Many people hear ringing in the ears, known as tinnitus, and researchers now think it could involve abnormally linked brain waves that extend across a large part of the brain.

William Sedley at Newcastle University, UK, Phillip Gander

at the University of Iowa in Iowa City and their team recorded brain activity in an awake 50-year-old man with tinnitus, who had electrodes implanted to study his epilepsy.

The researchers used sounds to temporarily suppress the loudness of the tinnitus, and looked for shifts in brain-wave patterns as the tinnitus intensity changed. They found that low-frequency brain waves previously linked to tinnitus spread throughout a larger proportion of the auditory cortex than was thought. Mid- and high-frequency oscillations affected brain regions involved in auditory memory and perception.

The three sets of brain waves seem to interact to create a widespread system of abnormal activity.

Curr. Biol. <http://doi.org/338> (2015)

METROLOGY

Atomic clock smashes records

The world's best atomic clock has become even more accurate, neither gaining nor losing a second over 15 billion years — longer than the age of the Universe.

The clock keeps time using 2,000 ultracold strontium atoms trapped in a laser lattice. Its pendulum is a laser that has a frequency tuned to resonate with that of the photons that are released and absorbed by the atoms as they switch between two energy states. By using a more stable laser and by reducing the effects of environmental perturbations, Jun Ye at the JILA institute in Boulder, Colorado, and his team made the 'ticks' of the timepiece more uniform. This increased the clock's accuracy by three times compared with the previous record.

The result brings strontium-based optical clocks closer to replacing the current standard for time measurement, the caesium fountain clock, which makes lower-frequency atomic transitions.

Nature Commun. 6, 6896 (2015)

CLIMATE CHANGE

Weather extremes linked to warming

Global warming is responsible for three out of four hot temperature extremes around the world, and almost one-fifth of heavy precipitation events over land.

Erich Fischer and Reto Knutti at the Swiss Federal Institute of Technology in Zurich used climate simulations to compare the frequencies of daily hot and wet extremes over the past century with those projected for the twenty-first century under a high-emissions scenario.

They found that with 2°C of warming above pre-industrial levels, extreme events that were once expected to occur every 30 years or so might happen every 10–20 years.

Nature Clim. Change <http://dx.doi.org/10.1038/nclimate2617> (2015)

PHYSIOLOGY

Colour tunes the body clock

The changing brightness of sunlight during dawn and dusk is known to adjust circadian rhythms, but researchers now show that the shifting colour of the light does the same thing in mice.

Timothy Brown, Robert Lucas and their co-workers at the University of Manchester, UK, studied mice that were genetically engineered so researchers could stimulate the two colour-detecting pigments in the mouse retina one at a time. When they recorded the firing of neurons in the brain's clock centre, they found that this activity was in sync with changes in the colour of light between blue and yellow.

Mice exposed to lighting conditions that mimic twilight, including colour changes, showed differences in the timing of their daily body-temperature fluctuations, compared with animals exposed to light that shifted only in brightness. The authors

SOCIAL SELECTION

Popular articles on social media

When bar graphs go bad

Dodgy data analysis has come under fire in recent months (*Nature* <http://doi.org/34p>; 2015), and now an article in *PLoS Biology* takes aim at another staple of statistics. It argues that bar graphs used to describe a continuum of data are often uninformative and misleading, and should be purged from much of the scientific literature. The stance gained wide support from commenters on social media. "Hiding individual data points behind bar plots makes for ineffective graphics. Show the data!" tweeted Trevor Bedford, a virologist and computational biologist at the Fred Hutchinson Cancer Research Center in Seattle, Washington. "Everyone in the world with access to numbers and plot making software should have to read this paper," tweeted Tom Oates, a kidney specialist at Imperial College Healthcare NHS Trust in London.

PLoS Biol. 13, e1002128 (2015)



Based on data from altmetric.com. Altmetric is supported by Macmillan Science and Education, which owns Nature Publishing Group.

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suggest that the mammalian circadian clock uses colour to gauge the Sun's position during twilight.

PLoS Biol. 13, e1002127 (2015)

PALAEOGENETICS

Genomes reveal mammoth history

Genome sequences from two woolly mammoths provide a rare look at the genetic events leading up to extinction.

Eleftheria Palkopoulou and Love Dalén at the Swedish Museum of Natural History in Stockholm sequenced

the genomes of a woolly mammoth (*Mammuthus primigenius*; artist's impression pictured) that roamed Eurasia roughly 45,000 years ago, and of one that lived on a remote island some 4,000 years ago, just before the animals went extinct. Using the genomes to infer population trends, the team found that mammoths declined around 300,000 years ago, then recovered until about 12,000 years ago when mainland populations went extinct, leaving just a few hundred island-dwelling animals.

The island mammoth showed decreased genetic diversity, which could have contributed to extinction, the team says, adding that this

kind of genetic analysis could help conservation biologists to assess how much diversity has been lost from endangered species today.

Curr. Biol. <http://doi.org/34d> (2015)

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