

Sciencewatch

COMPILED BY JOHN SWAIN, NORTHEASTERN UNIVERSITY

Beer guides yeast evolution

Humans have a long relationship with the yeasts that make beer. Genetic and phenotypic analysis of 157 strains of *Saccharomyces cerevisiae* yeast used by the fermentation industry now reveal that they all originate from a few common ancestors and evolved in ways to make brewers happy. The work, led by Kevin J Verstrepen and Steve Maere of the Flemish Institute for Biotechnology in Belgium, also found that beer yeast possesses, in contrast to wild yeast, duplicated genes that help to break down maltotriose, a sugar in beer mash. Many also evolved a mutation that prevents production of 4-vinylguaicol, which is known to taint



Beer provides insight into the domestication origin of industrial yeasts, and may also help to select and breed new superior strains.

the flavour of beer. Beer yeast has also lost its ability to reproduce sexually, which would be needed to survive in a wild environment. On the other hand, wine yeast can still reproduce sexually, presumably because wine-making only happens in the autumn and the yeasts therefore have to get by without human support during the rest of the year.

● **Further reading**
B Gallone *et al.* 2016 *Cell* **166** 1397.

Hawking effect in water

An analogue of the Hawking effect, whereby black-body radiation is emitted by black holes, can be seen in general wave phenomena when analogue horizons are present as waves propagating on a stationary counter-flowing medium. When the flow matches the speed of the wave, the wave is blocked and converted into other branches of the dispersion relation. L-P Euvé of CNRS-Université de Poitiers in France and colleagues have now observed this phenomenon in the power spectrum and two-point correlation function in surface waves on a countercurrent of water in a linear tank. Furthermore, because the flow velocity near the blocking point decreases along the direction of flow, the system is in fact an analogue of a white hole (a time-reversed black hole).

● **Further reading**
L-P Euvé *et al.* 2016 *Phys. Rev. Lett.* **117** 121301.

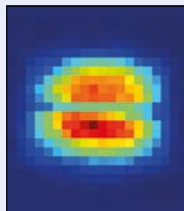
Weather bombs and earthquakes

The atmosphere-ocean system can drive the Earth to produce seismic signals called "microseisms". These can be produced by large slow-moving storms but also by smaller storms, and in particular small extratropical storms dubbed "weather bombs", in which the central pressure drops rapidly. Using a seismic array in Japan, Kiwamu Nishida of the University of Tokyo and Ryota Takagi of Tohoku University

Ghost imaging with X-rays

Ghost imaging constructs images of objects using information from light detected at two detectors. The idea is to use correlations in intensities between an object beam that strikes the object and a reference beam that doesn't, similar to the use of intensity correlations from starlight to determine the diameter of a star. Now, two papers, one by Hong Yu from the Chinese Academy of Sciences, Shanghai, and colleagues and another by Daniele Pelliccia from RMIT University, Australia, and colleagues, report achieving this for the first time using synchrotron X-rays. Both use a multi-pixel detector for the reference beam and a single-pixel "bucket" detector for the object beam, but one group takes data in Fourier space and the other in real space. The work is of particular interest for medical imaging because the imaged object is subjected to a much lower dose of radiation than in conventional imaging.

● **Further reading**
D Pelliccia *et al.* 2016 *Phys. Rev. Lett.* **117** 113902.
H Yu *et al.* 2016 *Phys. Rev. Lett.* **117** 113901.



Ghost images of a copper wire produced by X-rays at the European Synchrotron Radiation Facility in Grenoble, France.

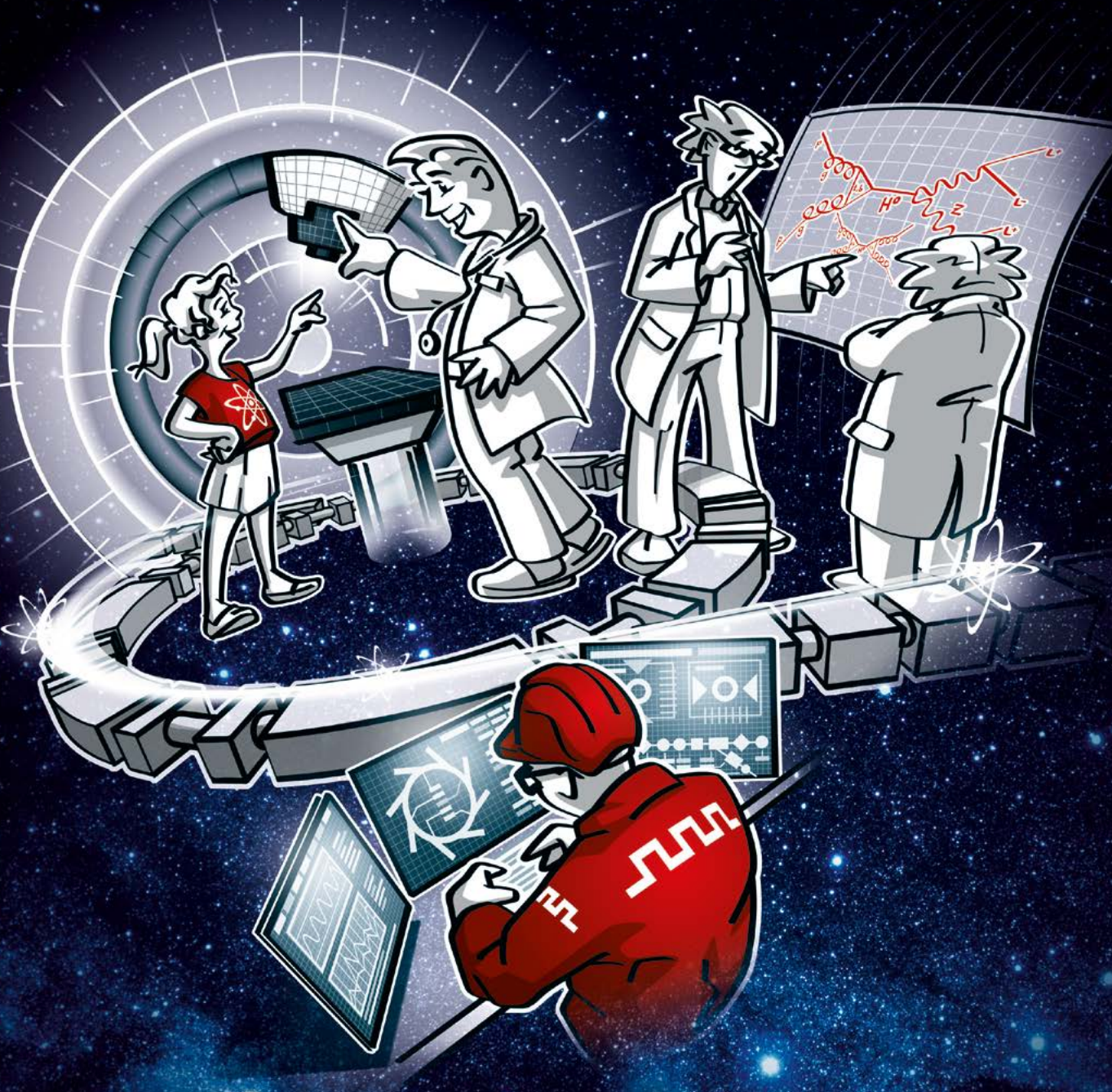
report both P-wave and previously unobserved S-wave microseisms produced under a weather bomb between Greenland and Iceland. Non-linear forcing of an ocean swell with a 1D Earth model can explain P waves and vertically polarised S waves, but not horizontally polarised S waves. This makes weather bombs a possible new probe of the Earth's interior.

● **Further reading**
K Nishida and R Takagi 2016 *Science* **353** 919.

Record light squeeze

A new record has been set in squeezing of the quantum state of light, which could be important for improving the sensitivity of gravitational-wave detectors and for more precise calibrations of photoelectric detectors. Henning Vahlbruch of Leibniz Universität Hannover and the Max-Planck-Institut für Gravitationsphysik and colleagues used degenerate parametric down-conversion in a doubly resonant optical parametric amplifier to reduce amplitude fluctuations by a factor of 32 (15 dB) relative to classical noise. The result was demonstrated at a wavelength of 1064 nm, which is the wavelength used in all current interferometric gravitational-wave observatories. With this squeezed light, the team was also able to measure the quantum efficiency of a customised InGaAs PIN diode with a 0.5% uncertainty.

● **Further reading**
H Vahlbruch *et al.* 2016 *Phys. Rev. Lett.* **117** 110801.



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