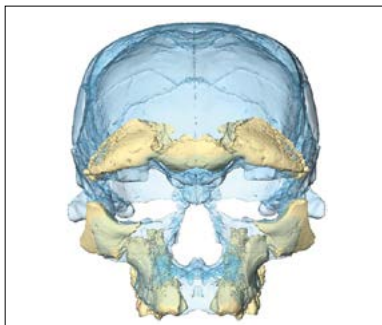


Sciencewatch

COMPILED BY JOHN SWAIN, NORTHEASTERN UNIVERSITY

Human origins pushed back

New remains found in a Moroccan mine could radically revise the current idea that humans originated in East Africa some 200,000 years ago. Jean-Jacques Hublin of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, and colleagues analysed bones of at least five humans found at Jebel Irhoud, a barite mine 100 km west of Marrakesh. Sharpened flint tools, gazelle bones and lumps of charcoal were also found. These are the oldest known bones of modern humans, with an average age determined from thermoluminescent dating of 315 ± 34 thousand years, and the



A superimposition of bone fragments from two individuals, shown in beige and light blue, represents how the skulls of our earliest ancestors might have looked.

ages determined are also consistent with faunal and microfaunal assemblages. This pushes back the origin of humans by an amazing 100,000 years, while also suggesting new geographical origins.

● Further reading

J-J Hublin *et al.* 2017 *Nature* **546** 289.
D Richter *et al.* 2017 *Nature* **546** 293.

GR weighs a white dwarf

The detection in 1919 of starlight that had been deflected by the Sun was one of the first convincing proofs of Einstein's general theory of relativity. Now, Kailash Sahu of the Space Telescope Science Institute in Baltimore and colleagues have used the Hubble Space Telescope to measure the analogous bending of light around the white-dwarf Stein 2051B, allowing them to calculate its mass to be 0.675 ± 0.051 solar masses. In addition to the first measurement of the deflection of starlight by a star other than the Sun, the work provides valuable verification of the relation between the mass of a white dwarf and its radius.

● Further reading

K Sahu *et al.* 2017 *Science* **356** 1046.

Solid-state refrigerators

Harmful chlorofluorocarbons (CFCs) in refrigeration devices could be replaced with solid refrigerants that are more efficient and environmentally benign. Pedro Jorge von Ranke of the Universidade do Estado do Rio de Janeiro has shown that materials called spin-crossover systems have pressure-induced changes in entropy between low-spin and high-spin states that are large enough to use for a practical cooling cycle. These giant "barocaloric" effects are analogous to magnetocaloric effects, but use pressure instead of magnetic fields.

● Further reading

P von Ranke 2017 *App. Phys. Lett.* **110** 181909.

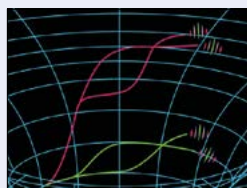
Tidal phase shift measured

In what is arguably the first manifestation of gravity in a quantum-mechanical system, physicists have observed the tidal phase shift in an atom interferometer. Peter Asenbaum of Stanford University and colleagues used a dual light-pulse rubidium atom interferometer, in which a macroscopic spatial superposition state acts as a nonlocal probe of space-time. Space-time curvature induces tidal forces on the wave function of a single quantum system, and the team was able to measure a phase shift associated with such tidal forces. Additionally, the dual atom interferometer works as a gradiometer for precise gravitational measurements and could be used for measurements of the gravitational constant or the gravitational Aharonov-Bohm effect.

● Further reading

P Asenbaum *et al.* 2017 *Phys. Rev. Lett.* **118** 183602.

The team measured the effect of the tidal force on the wave function of individual particles by varying the separation between the two arms of the sensor interferometer (green) while keeping the distance to the reference interferometer (pink) constant. (Image credit: APS.)



Humans smell better

According to neurobiologist John McGann of Rutgers University in the US, poor human olfaction is a 19th century myth. The idea that humans have a relatively poor sense of smell, he argues, did not come from empirical studies of human olfaction but from a 19th century anatomist's idea that human free will required a reduction in the brain's olfactory bulb. In reality, our olfactory bulbs are quite large and have similar numbers of neurons to those of other mammals. In fact we are able to track odour trails, and are even more sensitive than rodents and dogs to some odours.

● Further reading

J McGann 2017 *Science* **356** 597.

Ancient carvings and comets

It has long been speculated that a comet strike caused a sudden drop in the Earth's temperature during a period called the Younger Dryas. Now, researchers at the University of Edinburgh have found support for this view. They matched carvings at the Gobekli Tepe temple site in Turkey to star asterisms, and found that the famous "Vulture Stone", dated $10,950 \pm 250$ BC, fits well with the Younger Dryas event estimated at 10,890 BC. The date of the strike coincides with the emergence of agriculture and the beginnings of modern civilisation.

● Further reading

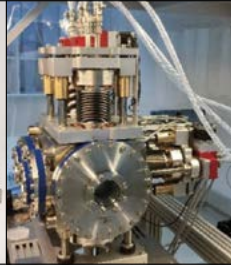
M Sweatman and D Tsikritsis 2017 *Mediterranean Archaeology and Archaeometry* **17** 233.



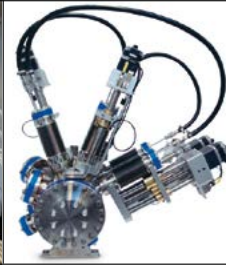
JJ X-RAY
Danish Science Design



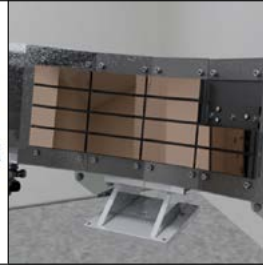
JOHANN SPECTROMETER



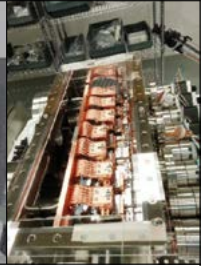
POWER SLIT



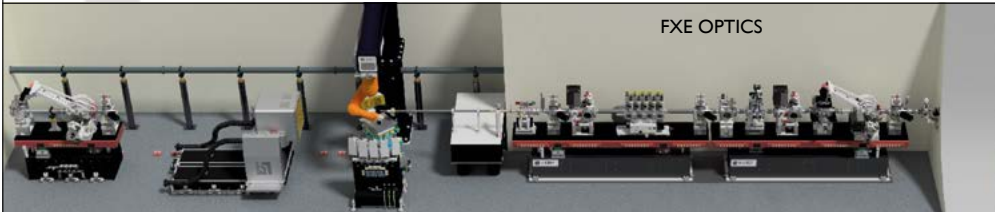
SOLID ATTENUATOR



VON HAMOS SPECTROMETER



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