Atomic clock hits the road

For the first time, scientists have used an advanced timepiece called an optical clock to make measurements outside a laboratory setting.

The general theory of relativity predicts that gravity slows the passage of time. This means that time flows more languidly at Earth’s low points than on mountain peaks, because points closer to Earth’s core feel the planet’s gravitational tug more strongly. To measure this effect, Christian Lisdat at the German National Metrology Institute in Braunschweig and his colleagues designed an optical clock — an ultra-precise atomic clock — that can be mounted in a car trailer. Such devices typically require a highly stable laboratory environment.

The authors moved their invention to a tunnel in the French Alps and used the clock’s exceptionally precise timekeeping to calculate the gravitational effect on time at the new location. Comparisons with reference data from a lab at a lower altitude showed that the portable clock’s measurements were consistent with conventional surveying techniques, although less accurate.

With improvements, the clock could be used to measure land heights with an accuracy of 10 centimetres, making it useful in remote settings where conventional surveys are difficult, the authors say. Nature Phys. http://doi.org/ckd3 (2018)

Dirt yields potent antibiotics

Microorganisms found in dirt have yielded antibiotics that can kill pathogens resistant to multiple drugs.

Seán Brady at the Rockefeller University in New York City and his colleagues analysed soil samples from their vast collection (a selection pictured). They extracted DNA from the samples and screened it for genetic sequences involved in the production of antibiotics by various bacteria.

The search turned up a new family of antibiotics that the team named ‘malacidins’. The compounds kill many formidable pathogens. When applied to the skin of rats, the new antibiotics sterilized wounds infected with methicillin-resistant Staphylococcus aureus (MRSA), a bacterium that can ravage large expanses of tissue. Nature Microbiol. http://doi.org/ckkw (2018)

Staked heads in Swedish lake bed

Prehistoric residents of what is now Sweden mounted the heads of some of their dead on wooden stakes before consigning them to the waters of a small lake.

Anna Kjellström and her colleagues at Stockholm University recovered two staked skulls and the remains of at least eight other individuals from an expanse of large, closely packed stones on a prehistoric lake bottom. The people who laid the stones and deposited the remains were hunter-gatherers living 7,500 to 8,000 years ago.

Seven of those left in the lake had suffered blows to the skull well before their deaths. The proportion of damaged to undamaged skulls and the positions of the injuries suggest that the trauma resulted from violence, rather than accidents, the authors say. Antiquity 92, 74–90 (2018)

A microbe’s recipe for a lethal toxin

Scientists have revealed the first steps involved in a microbe’s synthesis of a potent nerve toxin. The advance could help to make the compound, saxitoxin, medically useful.

Saxitoxin is made by aquatic bacteria and plankton. Although humans can die from eating shellfish contaminated with it, the compound’s nerve-blocking activity might make it useful as a long-lasting anaesthetic. Alison Narayan at the University of Michigan in Ann Arbor and her colleagues investigated an enzyme involved in manufacturing saxitoxin in the bacterium Cylindrospermopsis raciborskii T3.

First, the authors determined which chemical ingredients the enzyme uses as a feedstock. Then the team fed alternate forms of one ingredient to the enzyme, which made saxitoxin precursors that differed slightly from the one produced under natural conditions. The modified precursors could lead to forms of saxitoxin mild enough to act as a drug rather than a poison. J. Am. Chem. Soc. http://doi.org/ckkv (2018)

Ant medics save lives

Some ants nurse nest-mates wounded in battle, in an effort to prevent infection.

Squads of the termite-eating ant Megaepoera analis raid termite foraging sites, often losing limbs in the process. Erik Frank and his colleagues at the University of Würzburg in Germany collected raiding ants in Comoé National Park, Côte d’Ivoire, amputated either two or five legs to simulate injuries from a raid, and placed the injured warriors next to the trail leading back to the ants’ nest.

The team found that heavily injured ants were left behind, but those with two lost limbs were carried back to the nest in 46% of trials. Inside the nest, injured ants’ wounds were groomed by nest mates (pictured), possibly to remove dirt and apply antimicrobial substances. Treated ants were 70% more likely to survive the first 24 hours after injury than untreated ants. Proc. R. Soc. B 285, 20172457 (2018)

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