Research highlights

ASTEROID WITH THREE MOONS SETS A RECORD

Astronomers have discovered an unprecedented three moons in orbit around an asteroid.

'Binary' asteroids, which have one moon, are fairly common. Triple asteroids, with two moons, are rare. Now, the identification of the first known quadruple asteroid — Elektra, which orbits the Sun in the asteroid belt between Mars and Jupiter — shows that two is not the limit.

Previous observations had shown that two moons circle Elektra, which is roughly 200 kilometres wide. A team led by Anthony Berdeu at the National Astronomical Research Institute of Thailand in Chiang Mai re-assessed Elektra by analysing images of the asteroid taken in 2014 by the European Southern Observatory's Very Large Telescope at Cerro Paranal, Chile. The scientists used sophisticated image-processing techniques to detect the third, faint moon.

The new-found satellite lies, on average, just 344 kilometres from Elektra, making it hard to spot in the halo of sunlight reflecting off its parent asteroid. It is just 1.6 kilometres wide and orbits Elektra once every 16 hours.

It's still unclear how Elektra got its three moons.

Astron. Astrophys. **658**, L4 (2022)

THE ENGINEERED MICROBES PUTTING WASTE TO GOOD USE

Modified bacteria can turn waste gases, including carbon dioxide, into valuable chemicals — on a large scale.

Acetone and isopropanol are widely used industrial ingredients. But manufacturing them is energy-intensive and produces roughly double their weight in greenhouse gases.

Michael Köpke at LanzaTech in Skokie, Illinois, and his colleagues harnessed the bacterium *Clostridium autoethanogenum*, a natural producer of the fuel additive ethanol. Scientists had previously coaxed *C. autoethanogenum* to make ethanol in significant volumes from carbon monoxide.

Other species in the *Clostridium* genus can produce a mixture of acetone, isopropanol and other compounds, so the researchers mined *Clostridium* genomes for enzymes that could be used to prompt an engineered strain to produce only acetone or isopropanol. The authors showed that engineered microorganisms could produce either acetone or isopropanol continuously at a pilot plant (facility pictured) for 3 weeks.

The team estimates that using the process to make 1 kilogram of acetone or isopropanol could consume the equivalent of 1.78 or 1.17 kilograms of carbon dioxide, respectively.

Nature Biotechnol. https://doi.org/hh2g (2022)

ABOUT TIME: RATS ESTIMATE HOW LONG A TASK WILL TAKE

Rats can estimate how long they need to complete a task, helping them to stick to deadlines.

When making decisions, humans rely on internal clocks that tell us how much time we probably need for a task while accounting for some errors. To determine whether rodents can do the same, Tadeusz Kononowicz at the Institute of Psychology of the Polish Academy of Sciences in Warsaw and colleagues trained 16 rats to press a lever to receive food.

The animals had to either hold a lever down for 3.2 seconds or press it twice, with 3.2 seconds between pushes. They learnt to stick their noses into one portal if they had made a large timing error and into another portal if they had made a small one.

During both lever-pressing tasks, the rats seemed to know immediately whether they'd overshot the mark. Their ability to estimate the right amount of time improved over the course of dozens of trials, suggesting that each animal remembered its individual mistakes and learnt to account for them. The authors say the results suggest that rodents can monitor their internal uncertainty, possibly in the same way as humans and other primates.

Proc. Natl Acad. Sci. USA **119**, e2108850119 (2022)

HOW COLONIALISM FED THE FLAMES OF AUSTRALIAN FIRES

The unprecedented fires that devastated parts of Australia in 2020 can be attributed, in part, to colonialism.

Humans have played an integral part in shaping the southeast Australian landscape for millennia. Indigenous peoples, for example, changed their environment by routinely starting small-scale fires. Some researchers think that this practice, which was disrupted when British settlers displaced Indigenous communities, might have helped to reduce the risk of large wildfires.

To test this, Michela Mariani at the University of Nottingham, UK, and her colleagues assessed pollen and charcoal records from southeast Australia over 1,000 years. They found that the advent of European colonization was marked by a change in vegetation and wildfire activity. Before the late eighteenth century, what are now forested areas were mostly savannah grassland with intermittent tree cover. But in the past 300 years, owing to the cessation of Indigenous burning, a shrubby understorey has formed, leading to larger fires.

Climate change and many other factors affect the scale of wildfires, but the authors suggest that thinning the shrubby understorey could help to reduce fire severity in Australia.

Front. Ecol. Environ. https://doi.org/gpg6s6 (2022)

L TO R: LANZATECH; MARTIN POOLE/GETTY; MARK GRAHAM/BLOOMBERG VIA GETTY