New Scientist

WEEKLY 17 September 2022

WHY HUMANS ARE THE ONLY TALKING APES

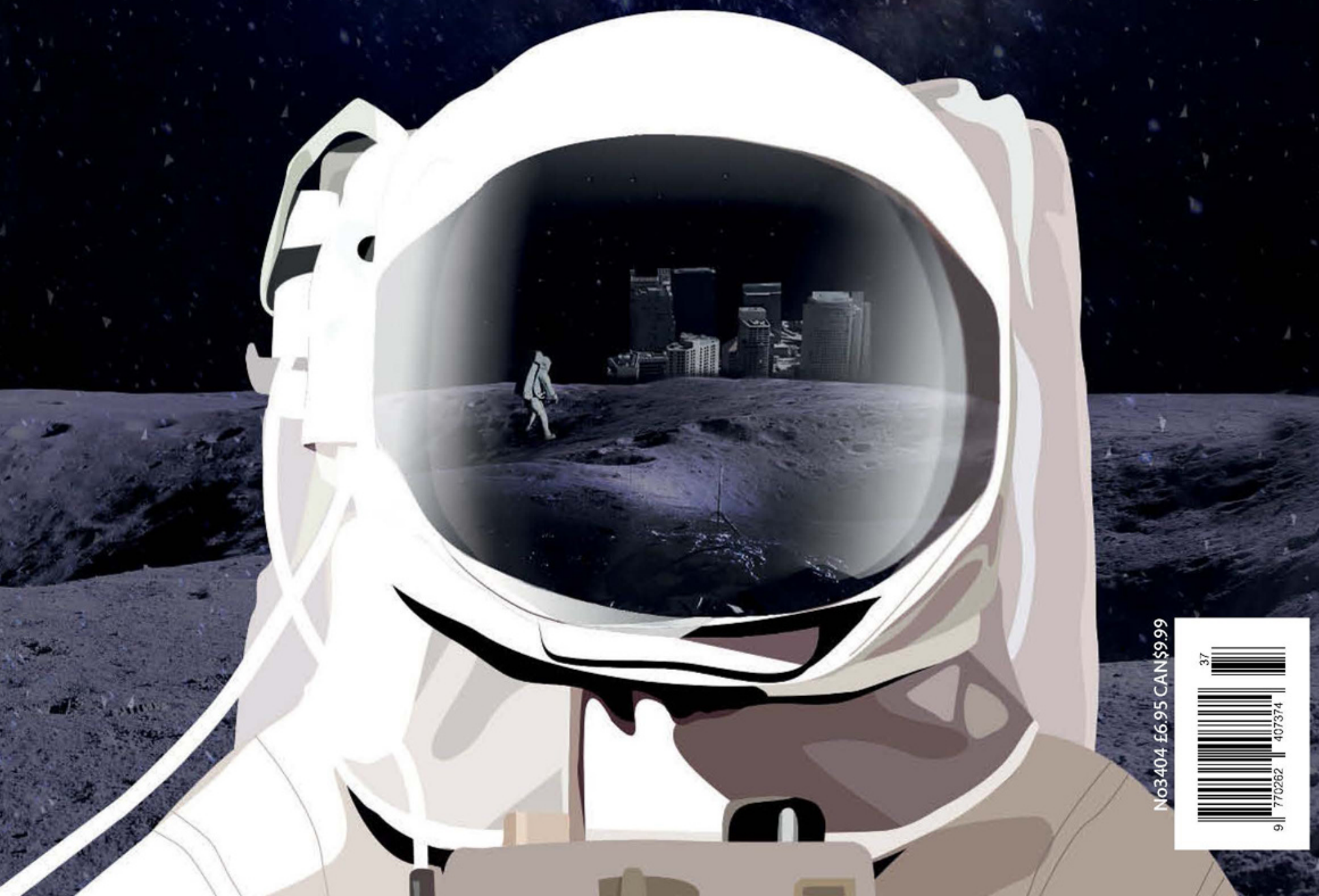
THE WONDERFUL BENEFITS OF OUTDOOR SWIMMING

HOW PROBIOTICS COULD BE USED TO TREAT RHEUMATOID ARTHRITIS

SPECIAL ISSUE

RETURN TO THE MOON

The new push to create a permanent lunar outpost, and what it means for humanity



No3404 £6.95 CAN$9.99

Exoplanets

Two potentially habitable super-Earth planets spotted orbiting red dwarf star

Alex Wilkins

A PAIR of rocky worlds slightly larger than Earth are orbiting in the habitable zone around a dim red dwarf star and one may be the second most Earth-like exoplanet discovered so far.

The planets are called LP 890-9b – which had been spotted before but we knew little about it – and LP 890-9c, also called SPECULOOS-2c. Both orbit a star called LP 890-9 or SPECULOOS 2.

Amaury Triaud at the University of Birmingham, UK, and his colleagues, who found SPECULOOS-2c, say both planets are in the habitable "Goldilocks zone" around the star, where conditions aren't too hot or too cold, so liquid water could exist on the surface, and potentially life.

To find planets in other solar systems, astronomers can look for a star's light dimming as a planet passes in front of it. This is hard when a star is as bright as the sun because the planets are comparatively dim, but easier if the host star is cooler and darker, which is the case with red dwarfs.

In 2021, NASA's Transiting Exoplanet Survey Satellite (TESS), which scans the entire sky for exoplanets, released a list of newly discovered potential planets. One of these, TOI-4306.01, also called LP 890-9b, caught the attention of Triaud and his team, so they have followed up with ground-based telescopes.

As well as confirming TESS's finding, they discovered a second planet, SPECULOOS-2c. It has a radius 30 to 40 per cent larger than Earth's and takes just 8.4 days to orbit its star. It is also tidally locked, which means it has permanent day on one side and night on the other. Despite these differences, the researchers calculated it was squarely in the habitable zone and could have liquid water on its surface. It also appears to be the second most habitable planet discovered so far outside our solar system, after TRAPPIST-1e (*Astronomy & Astrophysics*, doi.org/jbv5).

"The system is the second best at the moment to study the climate of or find out the atmosphere"

ESO/ P. HORÁLEK

The SPECULOOS telescopes in Chile helped discover exoplanet SPECULOOS-2c

Triaud was part of the team that announced the discovery of TRAPPIST-1e in 2016 in a haul of at least three potentially habitable Earth-sized planets orbiting a red dwarf star called TRAPPIST-1. In the following years, more TRAPPIST planets were identified, and TRAPPIST-1e appeared most likely to be an Earth-like ocean world.

SPECULOOS-2c doesn't seem far off it, according to the team's data.

"From my calculation, the system is the second best at the moment to study the climate of or find out the atmosphere with an instrument like the [James Webb Space Telescope (JWST)]," says Triaud.

The definition of a habitable zone changes depending on the properties of the star concerned. Observations of SPECULOOS-2c with JWST could help us understand what makes a planet habitable, says Beth Biller at the University of Edinburgh, UK. However, the planet's larger-than-Earth size and closer proximity to its host star, which might imply a higher level of powerful radiation, counts against its potential habitability, she says. ▮

Technology

Trick makes objects seem heavy or light in virtual reality

VIBRATING pads placed on people's arms can make the illusion of holding light or heavy objects in virtual reality more convincing by making us disregard some inputs from our senses.

Some VR systems create a perception of mass by slowing down the movement of a virtual object relative to how much our limbs move. For example, if a person picks up a heavy metal sphere, the system can cause a "lag" by only moving a fraction of the distance that their hand moves in reality, giving the impression of heaviness. If they pick up a virtual sphere made of light plastic, the system can allow it to move slightly faster than the user's arm moves in reality, giving the impression of lightness.

But if that trick is used too strongly, the illusion breaks, says Yutaro Hirao at the University of Tokyo. "At some point, the user starts to feel weird," he says. "The user notices that the physical portion and visual portion is different. And then the user starts to feel like 'oh, it's not my body any more'."

Hirao's solution is to trick the user's brain into relying more on the visual information they are receiving than the sensation of the position of their limbs, which comes from sensors called proprioceptors in our muscles, tendons and joints.

His team placed small vibrating motors above tendons in the arm to add noise to the signals from proprioceptors, making the signal less useful and causing the brain to lean more heavily on visual information – which in this case comes from the virtual world.

In an experiment involving 20 participants in virtual reality, the researchers simulated different weights by changing the difference between the movement of users' hands and the virtual objects they were handling.

They recorded the point at which the discrepancy became noticeable and found that adding tendon vibration made the illusion more persistent (arXiv, doi.org/jb7p). ▮

Matthew Sparkes