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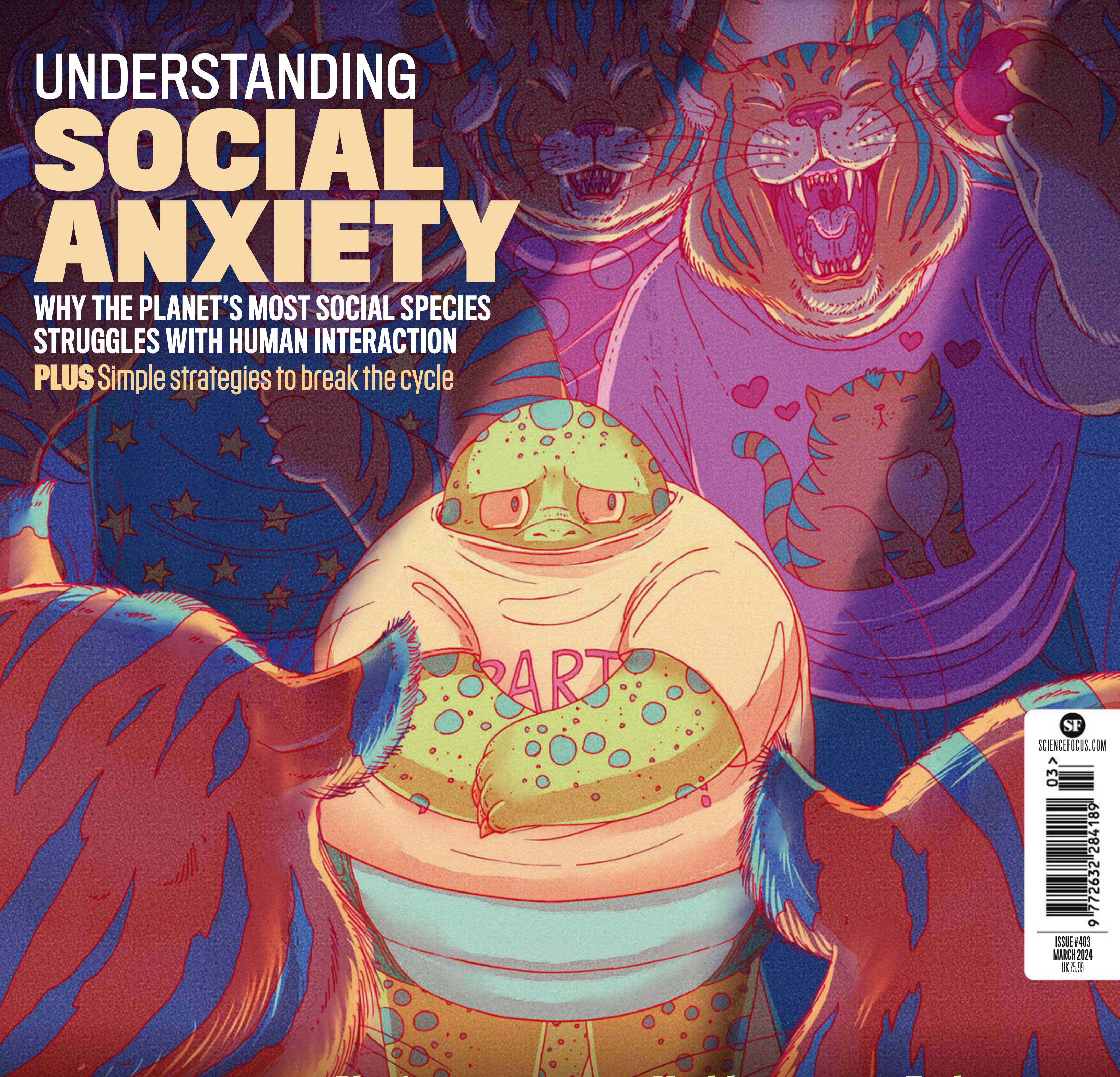

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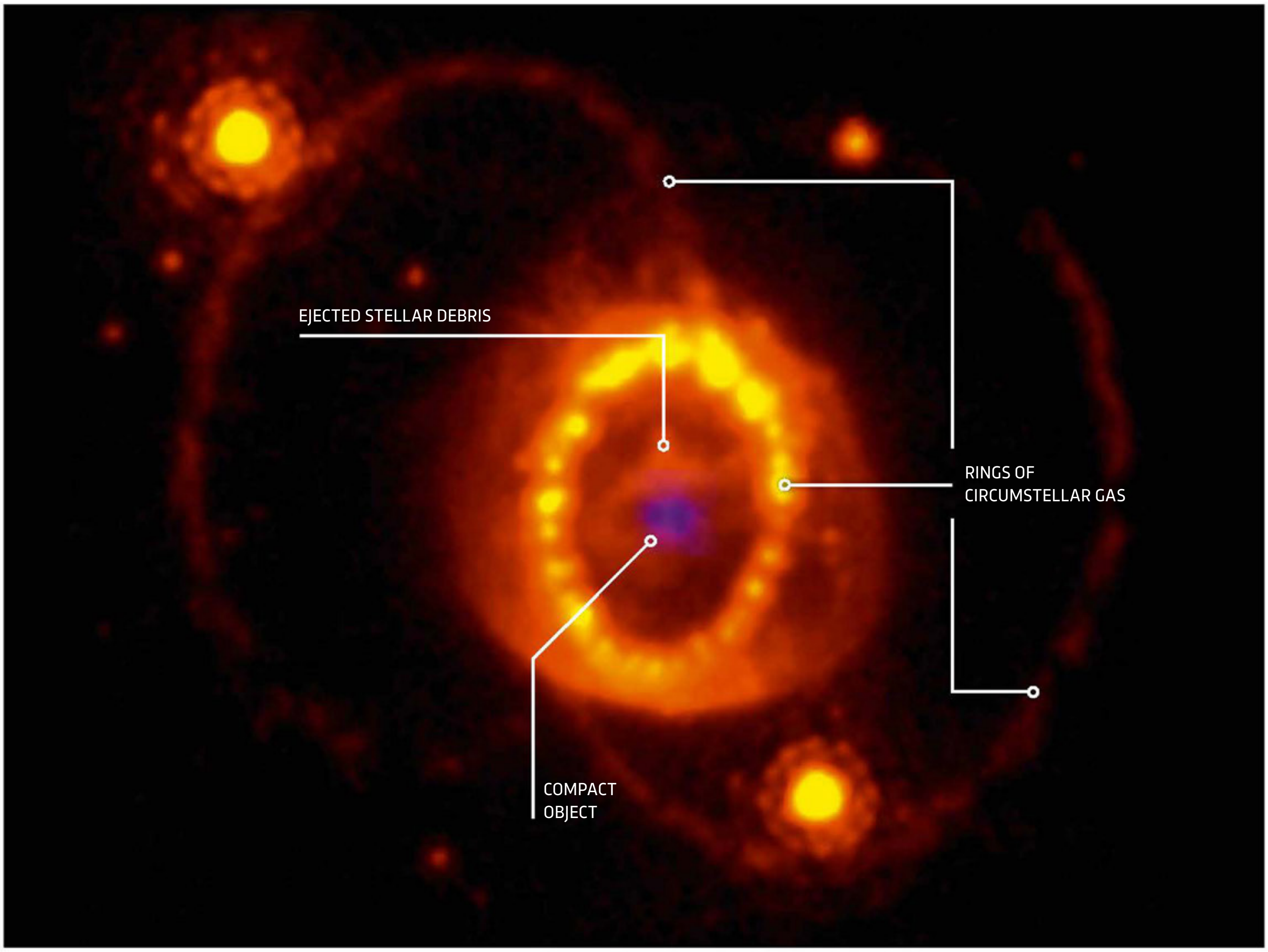
SCIENTISTS DISCOVER A TINY STAR HIDDEN INSIDE A GIANT SUPERNOVA

The James Webb Space Telescope has helped scientists solve a mystery that's been puzzling them for decades



It may look like the Eye of Sauron, but the tiny purple-blue sphere in the image above is actually an incredibly dense neutron star surrounded by stellar debris. The image marks the moment an international team of astronomers found the neutron star hidden inside a giant supernova that exploded 37 years ago.

Named Supernova (SN) 1987A, the exploded star is the most studied supernova and the brightest one in 400 years. For a few months before it faded, it could even be seen with the naked eye from Earth. But what remained hiding at its centre has been a source of mystery for almost four decades.

"What remained hiding at its centre has been a source of mystery for almost four decades"

Supernovae form when a star over 8-10 times more massive than the Sun collapses, resulting in a spectacular explosion. The collapsed core often turns into a smaller neutron star (a body made of the densest matter in the Universe) or a black hole.

However, no compact object had ever been found within SN 1987A, which is in the Large Magellanic Cloud, despite

An artist's impression of a neutron star, the type of object thought to be hidden in the centre of SN 1987

signs that a neutron star had formed. The most significant clue was that neutrinos (unimaginably small subatomic particles) produced by the supernova were detected by instruments on Earth the day before the explosion was seen on 23 February 1987.

A dust cloud produced by the explosion blocked visible light from the supernova's centre, obscuring what was behind and leading to the biggest unsolved problem in the study of SN 1987A. But new research, published in the journal *Science*, may have finally seen through this dust by observing the supernova at infrared wavelengths. Using the James Webb Space Telescope (JWST), the researchers discovered heavy argon and sulphur atoms whose outer electrons had been ionised – stripped away – close to where the supernova had taken place.

This effect, the researchers say, could only have been caused by a neutron star. Ionisation would have happened either as the star rapidly rotated and dragged the particles around it, or by its ultraviolet and X-ray radiation as it cooled (from a whopping 100 billion to one million degrees Celsius).

One of the researchers, Prof Josefin Larsson, of the KTH Royal Institute of Technology in Stockholm, said: "This supernova keeps offering us surprises. Nobody had predicted that the compact object would be detected through a super-strong emission line from argon, so it's kind of amusing that that's how we found it in the JWST [data]."

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MEDICINE

MICROSCOPIC ROBOTS COULD SOON ENTER PATIENTS' LIVERS TO FIGHT CANCER

Researchers are closing in on a novel approach to treat tumours using tiny robots

Microscopic robots might be a common sci-fi theme, but they're increasingly finding their way into real-life applications.

The most recent application comes from a team of researchers in Canada who are using tiny bots, in conjunction with magnetic resonance imaging (MRI) machines, to treat liver cancer. As the robots are made of iron-oxide nanoparticles, they can be guided by an external magnetic field – in this case, the field generated by the MRI machine – to theoretically provide targeted medical treatment.

To do this, the researchers have developed an algorithm to guide the microrobots to the arterial branches that feed a tumour. The algorithm fine-tunes the magnetic field to overcome the force of gravity acting on the robots (in case the spot where the robots are injected is lower than the tumour) and accurately guide them to the treatment sites.

They've since tested the algorithm and microbots in 12 pigs. The bots navigated the branches of the animals' hepatic arteries and reached their destination successfully. And that's not all.

"Using an anatomical atlas of human livers, we were able to simulate the piloting of microbots on 19 patients treated with transarterial chemoembolisation [chemotherapy directed at the hepatic artery]," said Prof Gilles Soulez, at the Centre Hospitalier de l'Université de Montréal (CHUM).

"They had a total of 30 tumours in different locations in their livers. In more than 95 per cent of cases, the location of the tumour was compatible with the navigation algorithm to reach the targeted tumour."

The treatment has various advantages, one of which is that it's easier to visualise tumours on MRI scans than on X-rays. The method can also be performed using existing instruments, such as implantable catheters like those used in chemotherapy. This research marks a step towards changing how interventional radiology treats liver cancers. The most common of these, hepatocellular carcinoma, is responsible for 700,000 deaths around the world every year.

But, despite significant strides, clinical application of this kind of technology is still a long way off.