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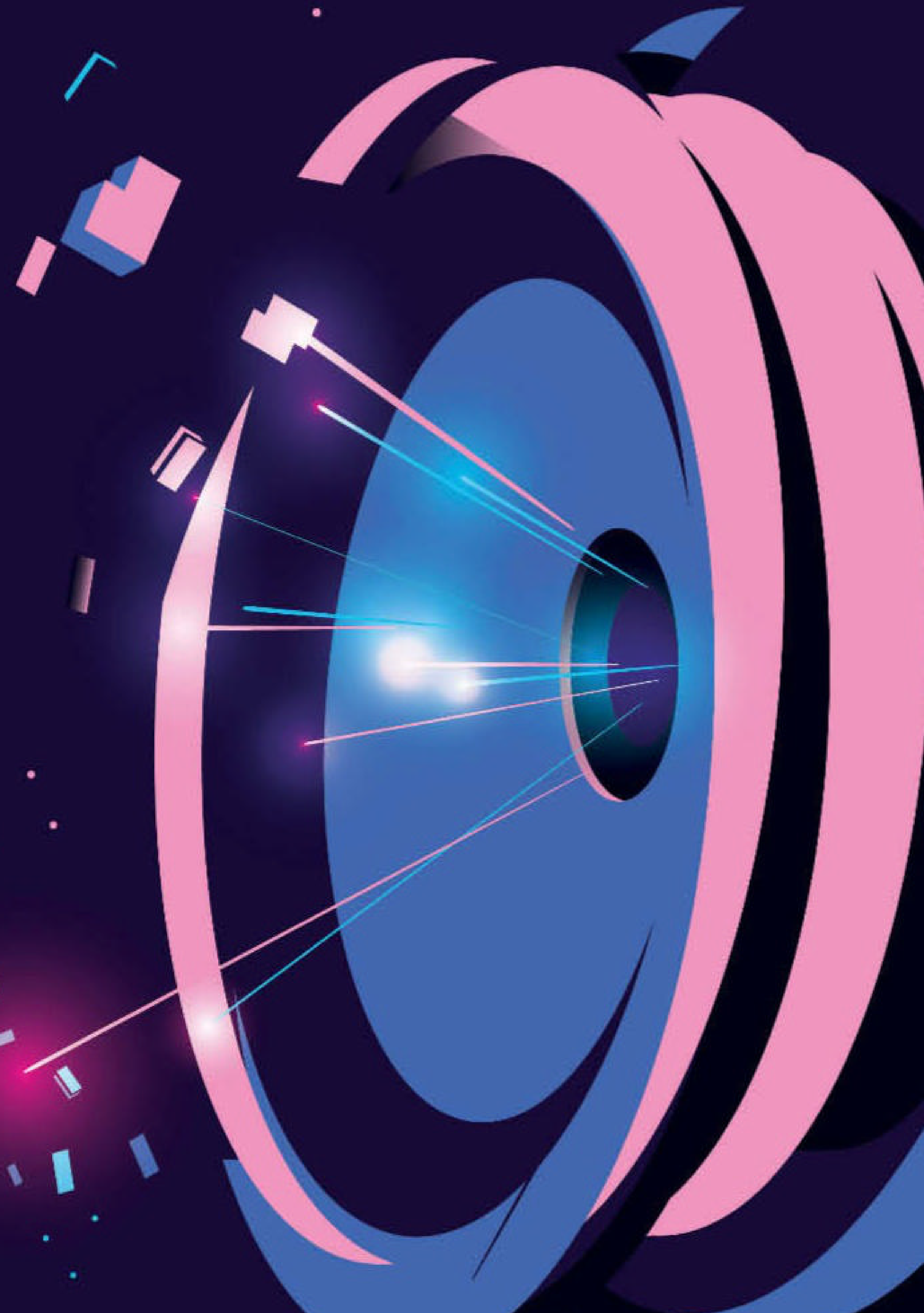

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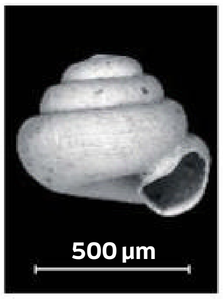
Animals

World's smallest land snail could fit in a grain of sand

Chris Simms

A NEWLY discovered snail species is the smallest yet found on land. *Angustopila psammion*, discovered in cave sediment in northern Vietnam, has a shell just 0.48 millimetres high and a shell volume of only 0.036 cubic millimetres. This makes it so small that you could fit about five individuals inside the average grain of sand.



CONTRIBUTIONS TO ZOOLOGY 2022

Angustopila psammion is a very tiny snail

Unsurprisingly, these snails are hard to spot. To find them, Barna Páll-Gergely, a land snail taxonomist at the Eötvös Loránd Research Network in Budapest, Hungary, and his colleagues gathered soil samples from caves and placed them in a bucket of water. They then removed the floating debris, dried it, sieved it and examined it under a microscope (*Contributions to Zoology*, doi.org/hb66).

The snails probably didn't live in the caves, says Páll-Gergely. "We assume that the sediment had fallen in through crevices in the rock, because it contains bleached, opaque shells of surface-dwelling terrestrial gastropods. The living snails presumably live deep in limestone crevices close to or on root systems."

There are smaller known snails in the sea – the record holder there is *Ammonicera minortalis*, with a diameter of around 0.4 mm. That is probably close to the lower limit, which is determined by the number of neurons a newborn snail must have to be functional, and the shell of the adult snail being large enough to accommodate at least one egg. ▮

Astronomy

Merging black holes produce an exceedingly speedy runaway

Leah Crane

WHEN a pair of black holes merge, the resulting larger black hole can be sent hurtling away at incredible speeds – and now we have seen it happen.

Vijay Varma at the Max Planck Institute for Gravitational Physics in Potsdam, Germany, and his colleagues found this fast-moving black hole by taking a second look at data from the Laser Interferometer Gravitational-Wave Observatory (LIGO) in the US and its corresponding observatory in Italy, called Virgo. These measure gravitational waves, ripples in space-time caused by the motions of massive objects.

The signal that Varma and his colleagues studied is designated GW200129. It came from two black holes orbiting one another that spiralled inwards and smashed together, resulting in a single, larger black hole. They found that, before the merger, the black holes were spinning, and their spin axes weren't aligned with one another or the axis running through the point in space around which they orbited.

This hints at where the pair may have formed. "Isolated systems tend to give you aligned spins, according to models," says Leo Stein at the University of Mississippi. "When we see these misaligned spins, that's a hint that this binary may have formed in a more crowded environment," like a dense clump of old stars.

1500

Probable speed of the black hole in kilometres per second

That misalignment is also a deciding factor for the fate of the final black hole. When black holes merge, the momentum held by the spin has to go somewhere, and ends up being split between the gravitational waves emitted in the collision and the final black hole.

The merger can be compared to a cannon's firing, says Davide Gerosa at the University of Milano-Bicocca in Italy. "When the cannonball flies, the cannon recoils in the opposite direction," he says. "When the black holes emit gravitational waves, those carry some linear momentum – the gravitational waves are the cannonball and the black hole that is left behind is the cannon."

Researchers have calculated that this "kick" effect should be able to give black holes speeds of hundreds of kilometres per second, but this is the first observational evidence. Varma and his colleagues calculated that the final object's speed was at least about 700 kilometres per second and probably closer to 1500 kilometres per second, which may be fast enough to propel it out of its home galaxy (arxiv.org/abs/2201.01302).

This evidence that black holes can recoil after mergers is important, because removing a black hole from the crowded environment where it was born means that it won't be around to participate in more mergers. This makes it difficult to explain some of the larger black holes LIGO has spotted, which we would expect to result from a series of mergers.

It also means that the cosmos is full of black holes zooming around at extreme speeds, but that shouldn't worry us. "Space is so extraordinarily vast that there is basically no chance that on Earth we'll encounter anything like this," says Varma. "This one is happening billions of light years away, so even if it was pointed directly at Earth, we wouldn't have to start worrying about it any time soon. But it's pointed away from Earth." ▮

SHUTTERSTOCK/VADIM SADOVSKI

An artist's illustration of a black hole