New Scientist

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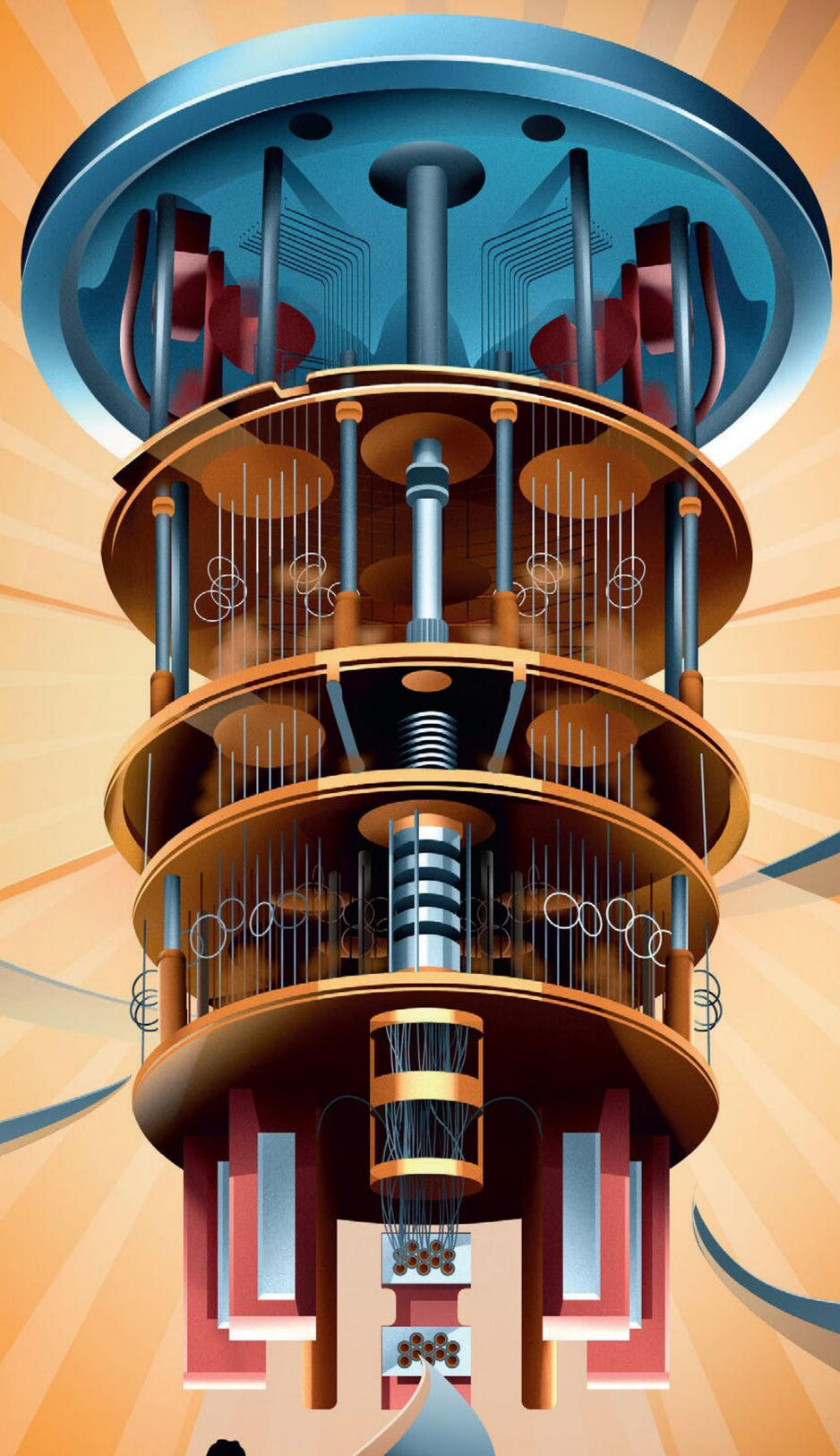

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Cosmology

Biggest object in the universe found

Spanning 1.4 billion light years, the structure may violate a fundamental cosmic assumption

Alex Wilkins

ASTRONOMERS have found the largest known structure in the universe. It is 1.4 billion light years across and contains nearly 70 galactic superclusters. It is also hundreds of thousands of times more massive than a single galaxy, such as the Milky Way.

Hans Böhringer at the Max Planck Institute for Physics in Munich, Germany, and his colleagues have named this cosmic structure Quipu after an Incan counting system made from knotted rope. Böhringer saw the ropes in a museum near Santiago, Chile, while he was working at the European Southern Observatory and thought it resembled the structure, which has a thicker main section and several thinner branching sections.

Over large distances, galaxies can clump together into clusters, which themselves can be grouped together into larger superclusters. Astronomers have previously mapped out several of these superclusters and found that they often link together into sweeping arcs or walls, such as the Sloan Great Wall or the Laniakea supercluster, which were the previous largest structures known in the universe.

"The Quipu superstructure, end to end, is slightly longer than the Sloan Great Wall," says J. Richard Gott III at Princeton University, who helped discover the Sloan Great Wall. "Congratulations to them for finding it."

"The Quipu superstructure is a very apparent structure. It immediately catches the eye"

To find Quipu, Böhringer and his team analysed data from the German ROSAT X-ray satellite, looking at galaxy clusters several hundred million light years from Earth. They worked out which might be part of a larger structure using an algorithm that defines a maximum distance each cluster can be away from another before we consider them not linked (arXiv, DOI: arXiv.2501.19236). "This was a very apparent structure," says Böhringer. "It immediately catches the eye."

Past discoveries of such large structures have caused arguments among cosmologists, who say that they are so large they violate one of our fundamental assumptions about the universe, called the cosmological principle. This says that, at very large distances, the universe should appear to be evenly spread out in every direction.

Cosmic superstructures, clumping together in uneven ways, would appear to violate this. But Böhringer sees no such problem, instead arguing we just need to consider the universe on even larger scales, and that similar structures can be found in the most accurate cosmological simulations. "Making observations in a too small part of the universe, which has been done earlier on, can be misleading," he says.

Part of the confusion comes from an ambiguous definition of the cosmological principle, says Alexia Lopez at the University of Central Lancashire in the UK. "There is not yet one definition of the cosmological principle that every cosmologist agrees on," she says.

Though the structure appears to be a single object, it is unclear whether the clusters in it are actually gravitationally bound together, says Seshadri Nadathur at the University of Portsmouth in the UK, which could prove problematic as the universe expands. "Some of those galaxies may drift apart from each other instead of collapsing in on themselves, in which case, according to some interpretations, it's not really a bound structure," he says. ▮

Technology

Prosthetic hand is able to open jars with ease

A LIGHTWEIGHT prosthetic hand that can move almost as freely as a human hand can help wearers carry out intricate tasks, such as tying knots, combing hair, opening jars and playing chess.

To replicate the dexterity of a human hand, most commercial prosthetics use electric motors or compressed air systems, which can make the system heavy and uncomfortable to wear for too long.

Now, Shiwu Zhang at the University of Science and Technology of China and his colleagues have developed a voice-controlled prosthetic hand that weighs just 220 grams – about half the weight of a typical human hand, but it can move in nearly as many directions.

To move its fingers and joints, the hand uses a shape memory alloy, a metal that changes shape when heated and then returns to its original form when it cools (*Nature Communications*, doi.org/n5nh).

"The shape memory actuators mimic the function of human muscles, enabling finger and wrist movements," says Zhang. "The prosthetic hand also employs a closed-loop control system that senses joint angles in real-time, facilitating precise and coordinated movements."

This alloy helps the hand's fingers to move in more complex ways, such as spreading fingers apart, which means they can do intricate movements that other prosthetic hands struggle with, like opening an elastic band with three fingers or manipulating a piece of string.

HAO YANG/USTC

A woman who tried the hand for 5 hours reported no discomfort

A woman with a right arm amputation trialled the prosthetic over 5 hours and was able to carry out tasks like writing, playing chess and combing her hair, without reporting discomfort.

"One of the main criticisms of prosthetic hands is how weighty and heavy they are and [the researchers have] managed to reduce the weight of their hand, which is great," says Cheryl Metcalf at the University of Southampton, UK. ▮

Alex Wilkins