five years monitoring the bats that lived there, collecting fresh guano and taking anal swabs[1].

They sequenced the genomes of 15 viral strains from the bats and found that, taken together, the strains contain all the genetic pieces that make up the human version. Although no single bat had the exact strain of SARS coronavirus that has been found in humans, the analysis showed that the strains mix often. The human strain could have emerged from such mixing, says Kwok-Yung Yuen, a virologist at the University of Hong Kong who co-discovered the SARS virus: "The authors should be congratulated for confirming what has been suspected."

But Changchun Tu, a virologist who directs the OIE Reference Laboratory for Rabies in Changchun, China, says the results are only "99%" persuasive. He would like to see scientists demonstrate in the lab that the human SARS strain can jump from bats to another animal, such as a civet. "If this could have been done, the evidence would be perfect," he says.

TRAVEL TROUBLE

Another outstanding question is how a virus from bats in Yunnan could travel to animals and humans around 1,000 kilometres away in Guangdong, without causing any suspected cases in Yunnan itself. That "has puzzled me a long time", says Tu.

Cui and Shi are searching for other bat populations that could have produced strains capable of infecting humans. The researchers have now isolated some 300 bat coronavirus sequences, most not yet published, with which they will continue to monitor the virus's evolution.

And they warn that a deadly outbreak could emerge again: the cave where the elements of SARS were found is just 1 kilometre from the nearest village, and genetic mixing among the viral strains is fast. "The risk of spillover into people and emergence of a disease similar to SARS is possible," the authors write in their paper.

Although many markets selling animals in China have already been closed or restricted following outbreaks of SARS and other infectious diseases, Yuen agrees that the latest results suggest the risk is still present. "It reinforces the notion that we should not disturb wildlife habitats and never put wild animals into markets," says Yuen. Respecting nature, he argues, "is the way to stay away from the harm of emerging infections". ■

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SPACE

Scientists pitch for remote human lab

Momentum builds for a crewed outpost around the Moon.

BY ELIZABETH GIBNEY

As the world's leading spacefaring nations plan for their next big outpost in space — a successor to the International Space Station — scientists are drafting a wish list of experiments for the most remote human laboratory ever built. NASA and the European Space Agency (ESA) are hosting meetings to discuss the science plans; the first took place on 5–6 December in Noordwijk, the Netherlands.

No nation has committed to fully funding the project, which does not yet have an estimated cost but is slated for launch in the 2020s. However, the space agencies are working on a plan to build an outpost in orbit around the Moon. Scientists are already jockeying for room on the platform. "I have been taken aback by the extent and the quality of proposals," says James Carpenter, human- and robotic-exploration strategy officer at ESA in Noordwijk, who organized the event and had to double its capacity to 250 people owing to the level of interest.

Known as the Deep Space Gateway, the platform is the "commonly accepted" next step once the International Space Station retires in the mid-2020s, says David Parker, director of human spaceflight and robotic exploration at ESA. The space agencies have made clear that its main purpose would be to test, from Earth's backyard, the technology for deep-space exploration and long-duration missions — including, eventually, going to Mars. "But we also want to work out how we get the best science out of it," says Parker.

COLLABORATIVE PROJECT

Scientists are eager to have input at the earliest stages of the planning process. Doing so could help the project to avoid the fate of the International Space Station, which some have criticized for failing to produce world-class science. But researchers should remember that the main purpose of both facilities is to support future exploration, says Richard Binzel, a planetary scientist at the Massachusetts Institute of Technology in Cambridge. "The space station is an instrument for human experience and, almost, space diplomacy," he says. "Where scientists get sniffy is in the claim that the science justifies the space station — it does not and it never has."

Still, researchers have already devised a vast array of experiments. The platform's location — outside Earth's protective magnetic field — would provide a unique environment for research, because conditions mimic those of deep space. It would also afford ready access

NASA

An outpost orbiting the Moon has been a key focus in proposals.

to the Moon. As well as testing how space affects human physiology and technology, researchers will propose ways in which the station could support planetary studies and allow for innovative physics and astronomy experiments, says Carpenter.

MOON-BOUND AND BEYOND

The workshop will showcase a host of physics experiments that not only would exploit the environment, but might also become economically viable only by piggybacking off the platform's power and navigation capabilities. These include a meteoroid-environment monitor, which would study the drifting interstellar dust that never reaches Earth owing to the planet's magnetic field. A low-frequency radio observatory could be used to pick up radiation from the Universe's 'dark ages', between 40,000 and 100 million years after the Big Bang — which is hugely challenging on Earth because of interference from human sources and the planet's ionosphere, says Mark Bentum, a physicist at the University of Twente in Enschede, the Netherlands.

A space station near the Moon would afford lunar scientists regular access to its surface, says Mahesh Anand, a planetary scientist at the Open University in Milton Keynes, UK. Water has been confirmed on the Moon in the past decade, but scientists still know little about where it is, how much there is and how feasible it would be to extract. Crew aboard an orbiting laboratory would also be able to control lunar rovers in real time, and could study Moon rock without the need to return samples to Earth.

"The space station is an instrument for human experience and, almost, space diplomacy."

Others are seeking to develop technology for deep-space travel. Armin Gölzhäuser, a physical chemist at Bielefeld University in Germany, wants to test the potential of nanometre-thick carbon nanomembranes, made from fused aromatic molecules, for potential use as long-lasting, thin and efficient filters that could recycle wastewater or air. Meanwhile, biochemist Katharina Brinkert at the California Institute of Technology in Pasadena and her colleagues have designed a device to boost the solar-assisted production of hydrogen and oxygen, optimized for use in microgravity.

Political interest in the platform is growing. In September, NASA signed a joint agreement with Roscosmos, its Russian counterpart, which outlined such a platform as part of the agencies' "common vision for human exploration". The Japanese and Canadian space agencies are also involved. Both NASA and ESA have already contracted with industry partners to undertake preliminary work.

But if and when the project moves forward will depend largely on NASA's new administrator. James Bridenstine, a Republican member of the US Congress from Oklahoma, has been nominated for the role but has yet to be confirmed for the post. If the Deep Space Gateway is to launch as planned in the mid-2020s, key decisions need to be made by the end of 2019, says Parker. ■

PUBLISHING

German row with Elsevier threatens journal access

Negotiations to reduce journal prices and promote open access are progressing slowly.

BY QUIRIN SCHIERMEIER

Around 200 German universities will lose their subscriptions to Elsevier journals within weeks, because negotiations have failed to end a long-term contract dispute.

The conflict between Elsevier, the world's biggest publisher of scientific journals, and Germany's entire university system has dragged on since 2015. Academics in the country lost access to Elsevier content briefly early this year, but it was later restored while contract talks resumed.

Advocates of open-access publishing worldwide say that victory for the German universities would be a major blow to conventional models of scientific publishing based on subscription fees. Germany's firm stand in the battle to reduce subscription prices and promote immediate open access could herald profound changes to the global landscape of scholarly publishing, they say.

"There is no doubt that what the German universities are asking for is the direction of travel for scholarly publishing," says Paul Ayris, pro-vice-provost of library services at University College London. "If Germany achieves this with Elsevier, other countries will want to follow suit."

Negotiators with 'Project DEAL', a consortium of university libraries and research institutes, have been in talks with Elsevier for more than two years. They want a deal that would give most scientists in Germany full online access to 2,500 or so Elsevier journals, at about half the price that individual libraries have paid in the past. Open access is proving to be the sticking point in the talks: under the deal sought, all corresponding authors affiliated with German institutions would be allowed to make their papers free to read and share by anyone in the world at no extra cost. ▶

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