early-stage trial results such as those released this week. But comparisons can be thwarted by the fickle nature of the tests researchers use to measure neutralizing-antibody and T-cell responses. The same test can return widely different values when performed in different laboratories, or even on different days.

"It's hard for us to compare our vaccine results to other people's," said vaccinologist Adrian Hill, a co-leader of the Oxford effort, in the briefing. "We would really like to see different vaccines being tested in the same lab by the same people."

Most of the front-runner vaccines "could do the trick", says Daniel Altmann, an immunologist at Imperial College London. But he worries that there is not enough emphasis on identifying candidates being developed by companies that are capable of making enough vaccine for much of the world. That could depend on myriad issues, such as sourcing glass vials and maintaining temperature-controlled supply chains. "That's like organizing a Moon landing or a world-war invasion," says Altmann. "Whichever candidates we pick, we want them to be the ones that can most optimize that."

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WHEN DID PEOPLE REACH THE AMERICAS? CAVE TOOLS STOKE DEBATE

Stone artefacts point to occupation more than 30,000 years ago – but not everyone is convinced.

By Colin Barras

Archaeologists excavating a cave in the mountains of central Mexico have unearthed evidence that people occupied the area more than 30,000 years ago – suggesting that humans arrived in North America at least 15,000 years earlier than thought.

The discovery, which includes hundreds of ancient stone tools, is backed up by a statistical analysis that incorporates data from other sites. But the conclusion has stirred controversy among some researchers.

The first humans in the Americas came from East Asia, but when they began to arrive is hotly debated. Some researchers think that it could have been as early as 130,000 years ago, although most of the archaeological evidence supporting this theory is disputed. For instance, some of the stone artefacts are so simple that sceptics say they were probably produced by natural geological processes rather than by people. The mainstream view is that the peopling of the Americas began about 15,000 or 16,000 years ago – based on genetic evidence and artefacts found at sites including the 14,000-year-old Monte Verde II in Chile.

The latest discoveries (C. F. Ardelean *et al. Nature* http://doi.org/d4wz; 2020) question that consensus. Since 2012, a team led by Ciprian Ardelean at the Autonomous University of Zacatecas in Mexico has been excavating Chiquihuite Cave, which is 2,740 metres above sea level in the country's Astillero Mountains. The researchers found almost 2,000 stone tools, 239 of which were embedded in layers of gravel that have been carbon dated to between 25,000 and 32,000 years ago.

Ardelean thinks the site might have been used as a refuge during particularly severe winters. At the height of the last ice age, 26,000 years ago, North America would have been a dangerous place. "There must have been horrible storms, hail, snow," he says, and the cave could have provided shelter to any humans who were around to witness the blizzards.

MADS THOMSEN

Excavations in Chiquihuite Cave, Mexico.

The team makes a good case for ancient human occupation, says François Lanoë, an archaeologist and anthropologist at the University of Arizona in Tucson. But he adds that data from caves are "notoriously troublesome" to interpret. Stone tools might have been shifted into deeper layers by geological or biological activity – perhaps moved by burrowing animals – making them seem older than they really are.

That's assuming they really are stone tools. "If an artefact is a stone tool, you see numerous chips removed from the edge," says Kurt Rademaker, an archaeologist at Michigan State University in East Lansing. He sees no clear evidence of this in the images in the paper.

Ardelean admits that some of the tools might have shifted into lower layers, although he says the 239 oldest ones lie beneath an impenetrable layer of mud formed during the last ice age, so they must be at least that old. He insists they are tools – in fact, he thinks some have telltale marks suggesting that they were made by novices learning from experts.

Aside from the stone tools, the team found relatively little evidence of humans at the site. Geneticists led by Eske Willerslev at the University of Copenhagen searched for ancient human DNA in the cave dirt, but with no luck.

Early settlers

In a second study (L. Becerra-Valdivia and T. Higham *Nature* http://doi.org/gg5s5f; 2020) two of Ardelean's co-authors – archaeologists Thomas Higham and Lorena Becerra-Valdivia at the University of Oxford, UK – combined the Chiquihuite Cave evidence with data from 41 other sites in North America and a region of eastern Siberia and western Alaska called Beringia, and built a statistical model of early human settlement. They concluded that people were present across North America much earlier than the accepted date of 15,000–16,000 years ago.

Some archaeologists think that it is time to take these ideas seriously. "The growing body of evidence for people in Beringia before 15,000 years ago renders their appearance in places like Mexico 20,000 or 30,000 years ago less surprising," says John Hoffecker, an archaeologist at the University of Colorado Boulder.

Others disagree. Collins says Becerra-Valdivia and Higham assume that early sites such as Chiquihuite Cave offer unambiguous evidence of human activity. "This is far from the case," he says.

Becerra-Valdivia accepts that evidence from most sites – except Monte Verde II – is disputed, but says that the analysis purposely omitted information from the most controversial sites, to make its case stronger.

If there were people in North America so early, it's unclear what happened to them. "There continues to be no convincing genetic evidence of a pre-15,000-years-ago human presence in the Americas," says geneticist David Reich at Harvard Medical School in Boston, Massachusetts.

Ardelean says there is a simple reason why genetic studies suggest that humans spread across the Americas only relatively recently: early groups such as the one he thinks was present at Chiquihuite Cave didn't survive to contribute to modern gene pools. "I definitely advocate for the idea of lost groups," he says.

CHINA'S MARS LAUNCH SEALS NEW ERA IN DEEP-SPACE EXPLORATION

The Tianwen-1 mission represents the country's first attempt to land on the red planet.

XINHUA NEWS AGENCY/SHUTTERSTOCK

Tianwen-1 is scheduled to arrive at Mars in February.

By Smriti Mallapaty

A Chinese spacecraft is on its way to Mars after launching successfully from Hainan Island in southern China. The mission — named Tianwen-1, which means 'questions to heaven' — is the country's first attempt to land on the red planet.

The 5,000-kilogram spacecraft, which contains a lander, orbiter and rover, blasted off from the Wenchang Satellite Launch Center aboard a Chinese Long March-5 rocket at 12:41 p.m. local time on 23 July. Some 36 minutes later, the craft was put on its trajectory towards Mars.

"This is a really ambitious mission driven by science that represents significant progress in China's space programme, and they should be proud," says David Flannery, an astrobiologist at Queensland University of Technology in Brisbane, Australia. A lot could still go wrong, he says, "but so far so good".

Chinese officials have been tight-lipped about many details of Tianwen-1, including the cost and launch preparations. "The Mars mission is very risky, so I understand why managers are keeping quite a low profile," says Ji Wu, former head of China's National Space Science Center in Beijing. Ji was chief scientist on China's attempt to send an orbiter to Mars aboard a Russian spacecraft in 2011, which failed. That mission "didn't even depart from Earth's orbit. That was a very sad story," he says.

Tianwen-1 is one of three daring missions to the red planet this year. The United Arab Emirates (UAE) launched its Hope orbiter last week, and the United States' craft — a six-wheeled rover named Perseverance — is likely to launch this week.

Together with the success of the UAE's orbiter, Tianwen-1 adds weight to a new reality, "that Solar System exploration is not the prerogative of the Euro-American world, but a global enterprise", says geologist Jon Clarke, who is president of the Mars Society Australia based in Canberra. China, India and Japan have previously sent probes into space, including missions to the Moon, Mars, Venus and some asteroids.

Tianwen-1 is now coasting through space before it reaches its destination in February. The craft will then spend several months positioning itself for the landing. In April, the orbiter will release the lander and rover into the Martian atmosphere, and these will touch down somewhere on Utopia Planitia — a vast plain littered with volcanic rocks, within a large basin. If the landing is successful, China will be only the second country, after the United States, to softly land a rover on Mars, says Flannery. The six-wheeled, solar-powered rover, which has a lifetime of around 90 Martian days — the equivalent of some 93 days on Earth — will explore areas of scientific interest.

The orbiter will loop around Mars for an entire Martian year — 687 Earth days.

China's mission aims to conduct a global survey of the planet, including studying its geological structures, surface characteristics and climate. The orbiter is packed with seven scientific instruments, and the rover has six more. These include several cameras, subsurface radar and a spectrometer.

A magnetic-field detector on the rover could gain valuable insights into Mars's past magnetic field, which would have shielded the planet from radiation, says Flannery. And its ground-penetrating radar will help discern some of the geological structures just below the surface of the planet, he says.

The mission "promises to be a milestone in Chinese and global exploration of the planet", says Clarke. "It will mean new and complementary data about Mars from orbit and from a new location on the Mars surface."

Mars has been a major focus of NASA's space exploration, says Katarina Miljkovic, a planetary scientist at Curtin University in Perth, Australia. "Adding new countries to the mix, like China and UAE, is very exciting," she says.

Smaller and newer space powers could also create opportunities for science, says Flannery, who helped build NASA's Perseverance rover. That rover will collect rocks that will one day be brought back to Earth. "Many of the greatest challenges for planetary science in the coming decades will require international cooperation," he says. Returning samples from Mars will be expensive and technically complex. China plans to bring samples back by 2030. In some sense, Tianwen-1 is testing the necessary technology for such a mission, says Flannery.