physicists towards an alternative theory, says Lincoln.

The signal was appealing in part because the analysis behind it was relatively simple and robust, says Christoffer Petersson, a theoretical physicist at Chalmers University of Technology in Gothenburg, Sweden.

The fact that the particle could have been a heavier cousin to the Higgs boson was also enticing, says Guido Tonelli, a physicist at the University of Pisa in Italy and former head of CMS.

Even though all those models are now wrong, it was a fun and useful exercise to try to explain the bump, says Petersson.

Statistical fluctuations and discoveries look identical at first, says Lincoln. Such coincidences are always possible when performing thousands of searches across a wide range of particle masses. It has happened before and will probably happen again, he says.

ONWARD

This false alarm does not affect the LHC's chances of finding something else, says Petersson. For now, it is business as usual for the collider's experiments.

Still, there is some concern that 40 years after the development of the standard model, particle accelerators, including the LHC, have not found anything beyond it.

It's surprising that nothing unexpected has emerged from the LHC data, says Guy Wilkinson, a physicist at the University of Oxford, UK. This underscores a growing unease in the community: as time goes on without new findings, it becomes less likely that the most appealing versions of supersymmetry — arguably the most promising way to extend the standard model — are true.

But Petersson notes that the chances that the LHC will find something beyond the standard model will go up this year and next, because the collider is operating near its maximum energy of 14 teraelectronvolts. If new particles are rare, or if they decay in ways that are hard to observe, they could take a while to emerge, he says.

And there are other ways of finding new particles, says Shears. With enough data, particles that are too heavy to be produced directly could reveal themselves through subtle influences on well-known particles. Physicists with LHCb, another experiment at the collider, have already found such hints, but they need more information to confirm them.

"We know already that sooner or later, one of these anomalies will survive all controls and suddenly — crack — everything will change," Tonelli says. "The beauty of our work is that this could happen at any time." ■ SEE EDITORIAL P.125

Perlan 2 aims to break the glider altitude record of 15,445 metres.

JAMES DARCY/AIRBUS GROUP

ATMOSPHERIC RESEARCH

Surfing glider set to study climate

Perlan mission will ride stratospheric waves and conduct atmospheric research.

BY DECLAN BUTLER

A glider that aims to soar higher than any other piloted aircraft will begin its first campaign this month in the skies above Argentina. For its pilots and engineers, the Perlan Project holds the excitement of breaking the world altitude record for gliding — and perhaps one day reaching close to the vacuum of space.

But for Elizabeth Austin, the project's chief scientist, there's another thrill: the glider will carry scientific instruments for climate, aerospace and stratospheric research that cannot be done using other means. "The possibilities are just so incredible," says Austin, an atmospheric physicist and the founder of forecasting service WeatherExtreme in Incline Village, Nevada.

The carbon-fibre glider, built with a pressurized cabin, is intended to achieve sustained flight at around 27,000 metres, where the density of air is about 2% of that at sea level. In the series of flights that the craft will begin in mid-August, it will fly to only 15,000–18,000 metres — in part because of weather conditions — but this could still break the glider altitude record of 15,445 metres, set by an earlier Perlan model.

The glider will carry instruments to measure levels of aerosols and greenhouse gases, including ozone, methane and water vapour, and will gather information on the exchange of gases and energy between the two lower layers of Earth's atmosphere: the troposphere and the stratosphere. Those data, to be collected this year and next, could improve climate models, which account poorly for these atmospheric interactions and contain "horrific" uncertainties about the levels and behaviour of water vapour at stratospheric altitudes, Austin says.

Scientific balloons have already flown at much higher altitudes, but they must follow the wind, Austin adds, whereas a pilot can steer and circle a glider. "We can spend hours flying where we want. A glider is an incredible scientific platform as there's no other way to get this sort of data."

"It's an extremely exciting project," says Jie Gong, an expert in atmospheric dynamics at NASA's sciences and exploration directorate in Greenbelt, Maryland. On the basis of its intended flight route, the Perlan glider might be able to provide the first direct observations of polar stratospheric clouds, a unique type of ice cloud that forms in the polar stratosphere and helps to deplete ozone, Gong adds.

The glider is named after those same clouds, which have an iridescent mother-of-pearl appearance (Perlan means 'pearl' in Icelandic). They are typically generated at high altitudes by stratospheric mountain waves — when strong winds that blow over the tops of high mountains are driven up towards space. In 1992, a retired NASA test pilot,

Einar Enevoldson, founded the Perlan Project with the aim of creating a glider that could surf these waves up to the stratosphere. And in 2006, he and the US adventurer Steve Fossett proved the concept with their record-breaking flight on Perlan 1, a modified conventional glider.

But Fossett's death the following year in a light-aircraft accident set the project back until July 2014, when European aerospace group Airbus became a major sponsor and contributed its research expertise. The Perlan 2 craft made its maiden flight last year in Oregon, and in March surfed its first mountain waves above the Sierra Nevada range in California.

Its next flights will be over El Calafate on the eastern and southern fringes of the Andes range in Argentina. There, during the South Pole's winter, a fast-moving, high-altitude jet stream called the polar-night jet extends from the troposphere into the upper atmospheric layers — helping the Andes mountain waves (and the glider) to reach the stratosphere (see 'Science on a glider').

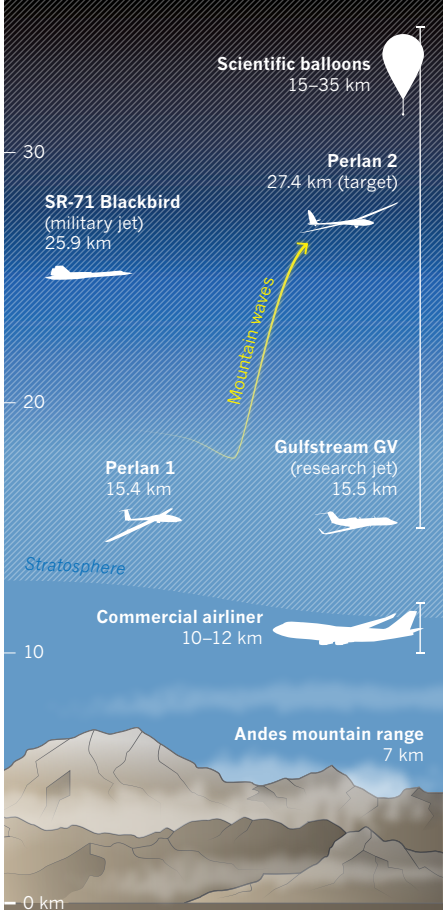
Besides its atmospheric chemistry, Perlan 2 will carry instruments to study turbulence in stratospheric mountain waves, and to explore the microphysics of interactions between mountain waves and polar meteorology, which ultimately affect weather variability. Information on how mountain waves break in the stratosphere is "extremely limited", says Gong, and requires detailed, fine-scale data on temperature, humidity and wind, which the glider is uniquely placed to measure. Airbus says that many of the weather phenomena Perlan 2 will encounter will provide useful information for it and other aircraft makers that are contemplating operating aeroplanes at higher altitudes.

Once Perlan is fully tested, says Austin, she hopes to get funding to use the glider as a long-term scientific platform that would examine how hourly, seasonal or even decadal changes in the stratosphere affect weather and climate.

A drone that could carry more instruments is a future possibility — but for now, a piloted craft is preferable and simpler, says Ed Warnock, the project's chief executive. Machines cannot yet match the best human pilots when it comes to climbing waves in such demanding flight conditions, he says.

Perlan's backers hope that it can surpass 27,000 metres in 2017 — and, ultimately, they intend another version of the glider to fly higher than 30,000 metres, where the air density is almost identical to that on Mars's surface. That might provide insight into how winged aircraft could fly on the red planet.

For now, engineers and scientists alike are just hoping to see the glider soar into the stratosphere above the Andes and take data. "Everything in the aircraft is experimental. It's a very difficult mission to do right, and to do it safely is not easy," Austin says. ■



SCIENCE ON A GLIDER
The Perlan glider aims to fly higher than any other piloted aircraft, and to conduct unique stratospheric research.

PAUL JACKMAN/*NATURE*

BIOMEDICINE

US to lift ban on funding for human–animal hybrids

Researchers in the United States will soon be able to resume chimaera-based projects.

BY SARA REARDON

Since September 2015, researchers have been banned from receiving funding from the US National Institutes of Health (NIH) for adding human stem cells to animal embryos, creating blends called chimaeras. But an NIH proposal released on 4 August lifts that moratorium, with certain exceptions. It also sets up a panel to review the ethics and oversight of grant applications.

The proposal shortens the window during which human cells can be introduced into non-human primate embryos, disallowing it before the central nervous system begins to form. This limits the number of human cells incorporated into a chimaera's brain. It also prohibits breeding animals containing human cells, preventing growth of a chimaeric embryo in a non-human womb or the birth of an animal more humanized than its parents. Grant applications that fall into a grey area would undergo a panel review.

The panel will pay particular attention to projects involving primates, mammals at very early developmental stages or those in which human cells could affect an animal's brain. Past a certain point, rodent embryos with human cells that could affect brain development are exempt from panel review, because there is little chance they would become human-like, says Carrie Wolinetz, NIH's associate director for science policy in Washington DC.

Currently, researchers use chimaeras to study early embryonic development and human diseases. But a major goal is to engineer animals to grow human organs that could then be transplanted into patients.

Unlike in the United States, it is illegal to perform such research without approval in the United Kingdom, even with private funding.

Steven Goldman, a neuroscientist at the University of Rochester in New York, says that the 2015 ban was overkill and is relieved that it will be lifted.

But Ali Brivanlou, a developmental biologist at Rockefeller University in New York City, says that the new rules should focus on limiting the percentage of the animal that becomes human instead of restricting the timing of modifications.

Bioethicist Françoise Baylis, at Dalhousie University in Halifax, Canada, worries that there are no clear guidelines on how chimaeras should be treated when used as research subjects.

These are the kinds of questions that the oversight panel will discuss when reviewing grant applications, says Wolinetz. The NIH proposal is open for public comment for 30 days, after which the agency will issue a final rule. Wolinetz hopes that it will be ready for the January 2017 grant cycle. ■