

## News in focus

conducted in Guinea towards the end of the 2014–16 Ebola outbreak in West Africa. There, the vaccine was administered to people who had been in contact with someone who was infected with Ebola, and to their subsequent contacts. It was found to offer a high level of protection against infection.

Health workers have used this strategy – known as ring vaccination – in the two other outbreaks in which rVSV-ZEBOV-GP had been deployed. But Heymann says it's important to determine whether the Merck vaccine has other uses – for instance, preventive administration to emergency health workers who might encounter Ebola in the distant future. For this, researchers will need to determine how long the vaccine's protection lasts, and whether a 'booster' dose can extend immunity.

Such studies are in the works with rVSV-ZEBOV-GP and competing vaccines, says Adrian Hill, a vaccinologist at the University of Oxford, UK. "The question remains, which vaccine would you give to, say, health-care workers to prevent them getting Ebola?"

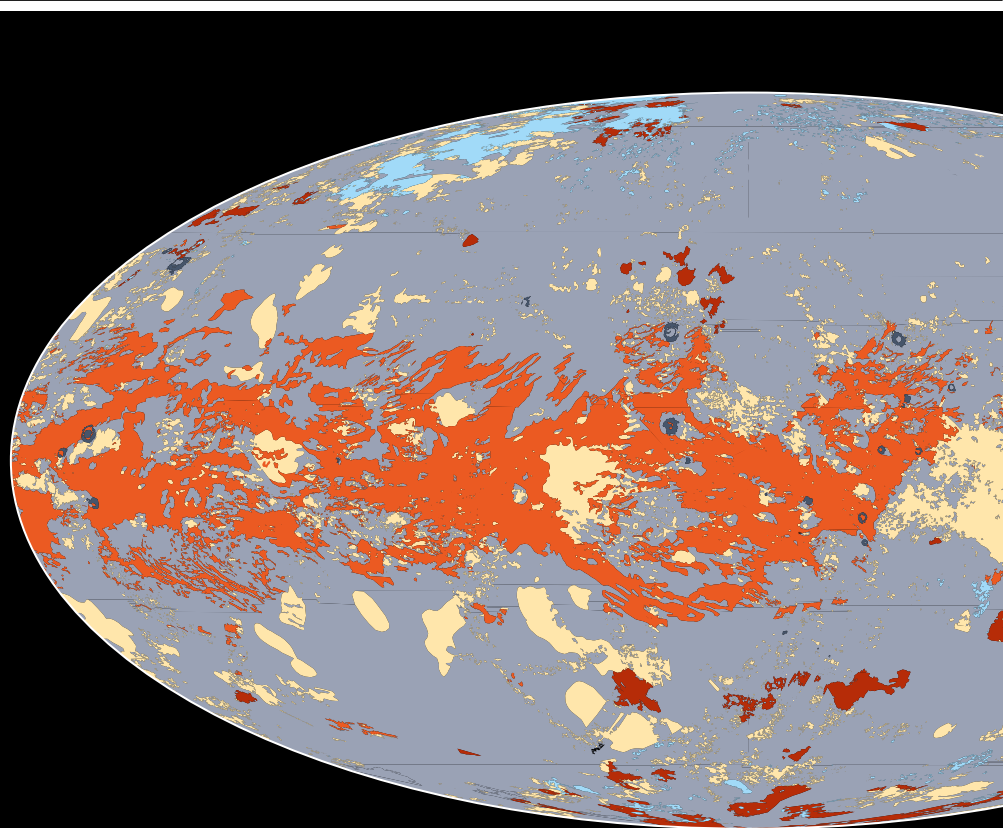
Merck's product protects against the Zaire species of the Ebola virus, which is behind the current DRC outbreak and the 2014–16 West Africa outbreak. It will be important to develop vaccines against other species of the virus – especially the Sudan species, which has caused seven known outbreaks since 1976, says Hill, who helped to test an Ebola vaccine that the London-based pharmaceutical company GlaxoSmithKline shelved in August.

There are seven other Ebola vaccines in various stages of clinical testing, according to the World Health Organization (WHO) in Geneva. In September 2019, the WHO announced that a vaccine manufactured by Johnson & Johnson in New Brunswick, New Jersey, would be used in the current DRC outbreak. Last week, the company submitted that vaccine for EMA approval.

Unlike the Merck vaccine, which is given in one dose, the Johnson & Johnson immunization requires a booster shot that is administered 56 days after the first injection. In the DRC, it will be given to people at risk of Ebola, such as health-care workers, in areas where the virus is not already circulating.

And next month, Gavi's board will decide whether to establish a global stockpile of Ebola vaccines. Merck, which is headquartered in Kenilworth, New Jersey, is seeking approval for its vaccine by the US Food and Drug Administration.

On 12 November, the WHO announced it had "prequalified" the Merck vaccine, which means that the product meets the agency's standards for quality, safety and efficacy. Other UN agencies, Gavi and many national health agencies look to this endorsement when procuring and delivering a vaccine.



## A map of Saturn's largest moon

Astronomers have used data from NASA's Cassini mission to map the entire surface of Titan, Saturn's largest moon, for the first time. Their charts reveal a diverse terrain of mountains, plains, valleys, craters and lakes unlike anywhere in the Solar System outside Earth.

The Cassini spacecraft orbited Saturn from 2004 to 2017 and collected vast amounts of information about the gas giant and its moons. The mission included more than 100 fly-bys of Titan, allowing researchers to glimpse the moon's surface through its thick atmosphere and survey its terrain in unprecedented detail.

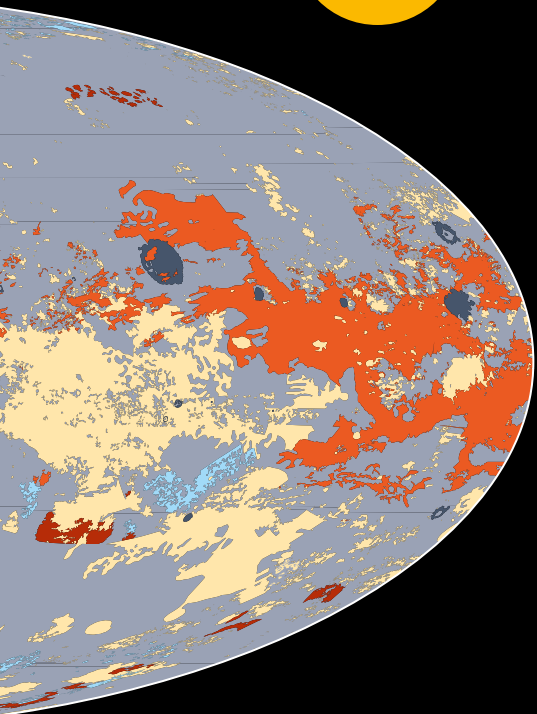
Rosaly Lopes, a planetary scientist at NASA's Jet Propulsion Laboratory in Pasadena, California, and her colleagues stitched together images and radar measurements taken by the spacecraft to produce the global map of Titan, which they published on 18 November in *Nature Astronomy* (R. M. C. Lopes et al. *Nature Astron.* <http://doi.org/dfb8>; 2019).

"Titan has an atmosphere like Earth. It has wind, it has rain, it has mountains. It's a really very interesting world, and one of the best places in the Solar System to look for life," says Lopes.

Nearly two-thirds of Titan's surface consists of plains, the map reveals, and 17% is covered in sandy dunes shaped

### Geographical features

-  Lakes
-  Craters
-  Dunes
-  Hummocky
-  Labyrinth
-  Plains



by the wind, mostly around the equator. Around 14% of the surface is classified as 'hummocky' — hilly or mountainous — and 1.5% is 'labyrinth' terrain, with valleys carved by rain and erosion. There are surprisingly few impact craters, suggesting that the moon's surface is fairly young.

Titan is the only world in the Solar System aside from Earth with known bodies of liquid on its surface. However, these seas and lakes are filled with liquid methane rather than water, and they cover just 1.5% of the moon's surface.

"The most profound discovery of Cassini is that Titan is so diverse," says Ralph Lorenz, a planetary scientist at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland. "It's almost like a completely different world."

By 2034, NASA plans to send a drone to Titan on the Dragonfly mission, which will fly across the surface and study it in multiple locations. But there are no current plans to send further orbiters to Saturn or its moons, so this map is likely to remain our best global view of Titan for the foreseeable future.

By Jonathan O'Callaghan

# LAB SEQUENCES GENOMES OF A CONTINENT'S BUTTERFLIES

Draft genomes of more than 800 varieties hint at the role of interbreeding in the animal's evolution.

By Ewen Callaway

**W**hen biologist Nick Grishin wanted to tackle big questions in evolution — why some branches of the tree of life are so diverse, for instance — his team set out to sequence the genomes of as many butterflies as it could: 845 species, to be precise.

In a study that some researchers are hailing as a landmark in genomics, Grishin's group at the University of Texas Southwestern Medical Center in Dallas sequenced and analysed the genome of what it called a "complete butterfly continent": every species of the creature in the United States and Canada. The study was posted on the bioRxiv server on 4 November<sup>1</sup>.

"I think it's bloody amazing, because the technology involved in sequencing 845 species is there," says James Mallet, an evolutionary biologist at Harvard University in Cambridge, Massachusetts. "It's a beautiful piece of work."

The data allowed Grishin's team to build an evolutionary tree detailing the relationships of all the butterflies, as well as to determine the pace at which new species formed. The

team suggests that fast-diversifying groups of butterflies are those that swap genes with close relatives through interbreeding — a phenomenon that could extend to other organisms.

Others, however, point out that most of these genomes will be of limited use to other researchers, because they are low-quality 'drafts' comprised of thousands of short DNA stretches, and not higher-quality sequences that have been assembled into longer stretches. Grishin says that the sheer number of genomes, even of low quality, allows his team to draw broad conclusions about evolution that could not be made from more limited data sets. He plans to make the genomes publicly available.

## Butterfly patterns

Grishin, whose research group studies the shape and evolution of proteins, started researching butterflies after reading a 2012 paper<sup>2</sup> on the diverse tropical genus *Heliconius*, whose species have elaborate wing patterns that mimic those of other butterflies. The study found that some genes that determine wing patterns seemed to have



A *Heliconius* butterfly.

TIM ZUROWSKI/SHUTTERSTOCK