New Scientist

WEEKLY April 24–30, 2021

FOCUS ON
CORONAVIRUS
Three million deaths and counting
Where does the pandemic go from here?
Global roll-out for Sputnik vaccine

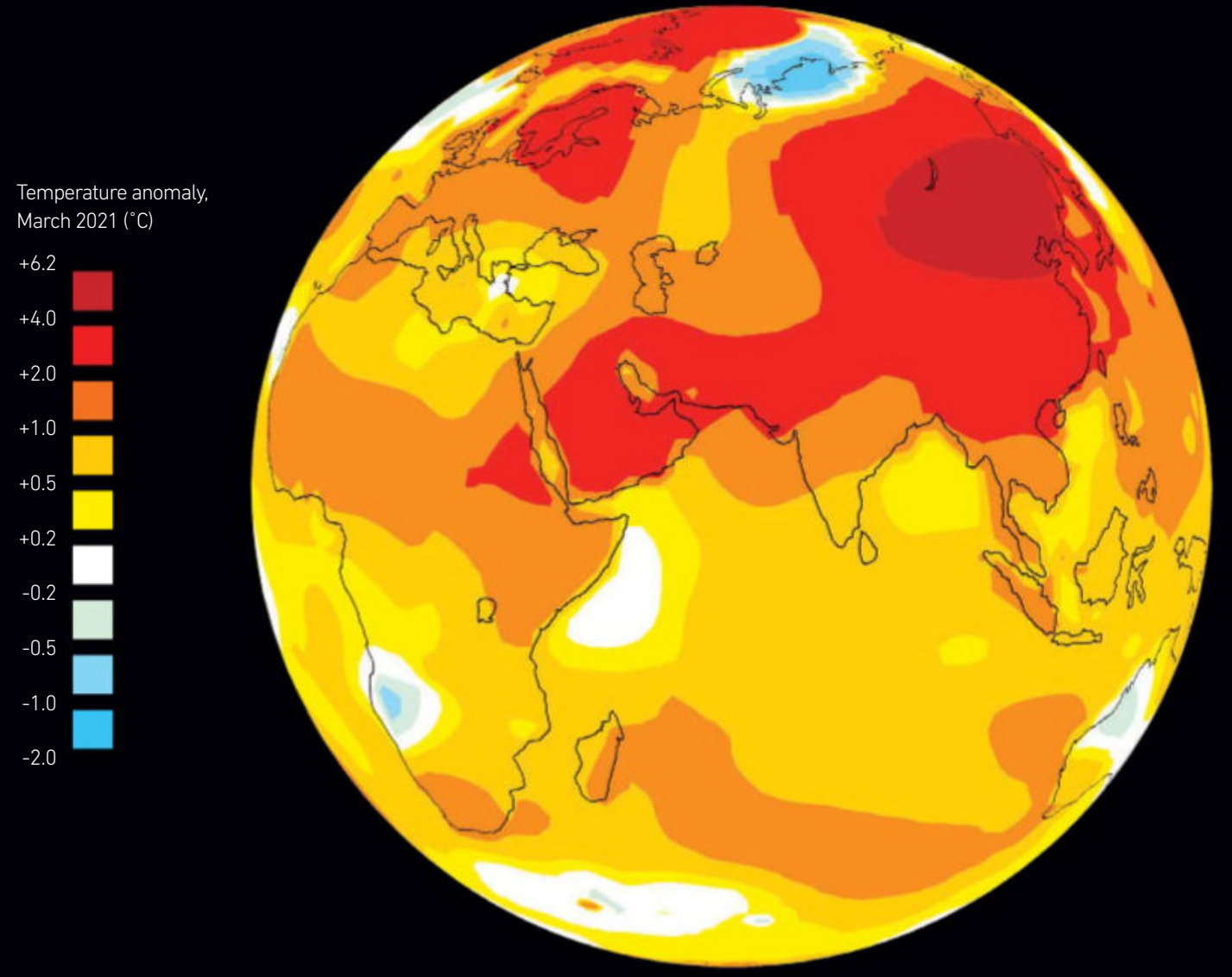
A IS FOR ANCIENT
The alphabet is older than we thought

SPECIAL ISSUE

CLIMATE CHANGE

YOUR GUIDE TO A CRITICAL YEAR

Where we are now · How bad it could get · What we need to do



PLUS LIGHTEST URANIUM / MARTIAN HELICOPTER TAKES OFF / RENAISSANCE WATERMELONS / **PLANT POACHING** / SELF-DRIVING BIKE

Science and technology news **www.newscientist.com**

No3331 US$6.99 CAN$9.99

Space exploration

First helicopter flight on another planet takes off

Leah Crane and Matthew Sparkes

NASA's Ingenuity helicopter has flown on Mars, making it the first vehicle to attempt powered flight on another world.

"We've been talking so long about our Wright brothers moment on Mars, and here it is," said MiMi Aung at NASA's Jet Propulsion Laboratory in California, speaking from mission control after the flight on 19 April.

Early images from NASA that were taken by the Perseverance rover show Ingenuity taking off on its short first test. The craft rose to around 3 metres, pivoted towards the rover and landed after about 30 seconds.

"To see it now finally happen on Mars, and happen exactly the way that we imagined it, is just a really incredible feeling," said Håvard Grip, Ingenuity's chief pilot, during a later press conference. Video taken by the Perseverance rover shows a smooth take-off and landing that looked almost exactly the same as the craft did during testing, said Grip.

NASA/JPL-CALTECH

Ingenuity took this picture of its own shadow as it hovered on the Red Planet

Ingenuity travelled to Mars beneath the Perseverance rover, which landed on 18 February. The helicopter was then dropped onto the surface of the planet and Perseverance drove off to give it room to prepare for flight.

The helicopter weighs in at 1.8 kilograms and is around half a metre tall. Its two rotors spin in opposite directions, which negates the need for the tail rotor found on a traditional helicopter. They turn at around 2500 revolutions per minute, which is about five times faster than on rotor aircraft on Earth, in order to generate sufficient lift in the thin atmosphere on Mars.

Ingenuity seems to be "extremely healthy" now, said Bob Balaram, the helicopter's chief engineer, in a press conference. The flight shook off some of the dust that had gathered on top of Ingenuity, and it is now generating more solar power than it was before lift-off.

"Beyond this first flight, over the next coming days we have up to four flights planned, increasingly difficult flights, challenging flights, and we are going to continually push all the way to the limits of this rotorcraft," said Aung.

The next flight could be as soon as 22 April, she said. At that point, the helicopter will attempt to rise 5 metres and fly 2 metres to the side before returning to its original location and landing. Then, in the third trip, the goal is to fly 50 metres away from its lift-off site before returning, and to do so at a higher speed than the previous journeys. ▮

Technology

Elephant trunk robot has a mind of its own

A ROBOTIC elephant trunk that uses artificial intelligence to mimic some aspects of brains could lead to snake-like machines that roam and adapt to new tasks.

Sebastian Otte at the University of Tübingen in Germany and his colleagues created a 3D-printed robot trunk from segments that each include several motors driving gears that tilt up to 40 degrees in two axes. The trunk can bend, but also elongate or shorten.

The researchers created a trunk with 10 segments, but they say the length could be doubled with more powerful motors. In tests, they found the AI guiding it could direct the tip of the trunk to within less than a centimetre of a target (arxiv.org/abs/2104.04064).

Controlling a robot with this many degrees of freedom is so taxing that traditional computer programming quickly becomes very complex. Instead, these kinds of robots are best operated by a neural network, an AI designed to mimic the operation of a brain with large networks of neurons connected by synapses. To control the trunk, the AI is trained on examples of various motor inputs needed to move it in certain ways.

The team used this robot as a proof of concept for a relatively new version of this type of AI that offers vastly improved efficiency. Called a spiking neural network, it works like a real brain, in that certain inputs cause a chain reaction of firing synapses. It uses orders of magnitude less computational power and energy.

> "It might be possible to make snake-like robots that are untethered and can roam at will"

Typical neural networks compute all the time, even if there is no activity, says Otte. "It's redundant and this is different in spiking neural networks. When there are no spikes, there's no computation," he says.

A lightweight robot with a relatively basic computer could run a spiking neural network and continue to train itself, potentially learning new tasks.

"Our dream is that we can do this in a continuous learning set-up where the robot starts without any knowledge and then tries to reach goals, and while it does this, it generates its own learning examples," says Otte.

The team says it might be possible to make snake-like robots where the trunk isn't tethered, but can roam. This might prove useful in search-and-rescue operations as it could weave into small spaces. ▮

Matthew Sparkes