



AL SEIB/LOS ANGELES TIMES/GETTY

Climate change could make wildfires like the one that decapitated this giant sequoia in California more frequent.

# THE SCIENCE EVENTS TO WATCH FOR IN 2021

Climate change and COVID-19 vaccines are among the themes set to shape research.

By Holly Else

## Climate comeback

2021 looks set to be a pivotal year for the fight against climate change. US president-elect Joe Biden has made clear that he will move to restore the country's leadership in that regard, including by rejoining the Paris climate agreement to fight global warming. (President Donald Trump pulled the United States out of the accord, and the nation officially left the day after the 2020 election.) A key moment for climate negotiations will come at the United Nations' climate conference in Glasgow, UK, in November. Countries will make a new round of pledges on cuts to greenhouse-gas emissions – the first since they signed the Paris agreement in 2015. The European Union and China have ambitious plans to become carbon neutral by

2050–60; scientists are waiting to see whether Biden will set similar goals for the United States.

## COVID detectives

A task force established by the World Health Organization will head to China in January 2021 to try to identify the source of the COVID-19 pandemic. The group, which includes epidemiologists, virologists and public- and animal-health researchers, will begin their search in Wuhan, the Chinese city where infections with the coronavirus SARS-CoV-2 were first identified in 2019. The initial stages of the project will look at meat and animals sold at the Huanan market – visited by many of the first people reported to have COVID-19 – and trace their journeys through China and across borders. Discovering the origins of the virus could take years,

but experts think some new information will come to light by the end of the year.

## Vaccines and the pandemic

2020 saw the roll-out of the first vaccines authorized for use against COVID-19. The effectiveness of several new vaccines will become clearer in early 2021. Of interest will be the results of phase III clinical trials of immunizations developed by the US drug firms Novavax and Johnson & Johnson. These jabs are likely to be easier to distribute than the RNA-based vaccines made by Pfizer–BioNTech and Moderna, which have returned phase III results but must be stored at very low temperatures. The Pfizer and Moderna vaccines and one developed by the University of Oxford, UK, and AstraZeneca already have emergency authorization for use in some countries. Late last year, Novavax launched two large trials of its viral-spike-protein vaccine in the United Kingdom and the United States, which will report in early 2021. The firm could produce as many as two billion vaccine doses per year. Johnson & Johnson is testing a single-shot version of its vaccine; by contrast, those from Pfizer and Moderna require two.

## Open-access drive

All eyes will be on science publishing in 2021 as a two-year open-access project organized by



some of the world's largest research funders comes to fruition. More than 20 organizations, including Wellcome in London, the Bill & Melinda Gates Foundation in Seattle, Washington, and Dutch national funder NWO, will from January start stipulating that scholarly papers published from the work they fund must be immediately free to read. The initiative, called Plan S, could spell the end of journal subscriptions and allow anyone to read the scientific literature. Plan S has already prompted several titles – including *Nature* – to offer open-access publishing for the first time. (*Nature* is editorially independent from its publisher, Springer Nature.)

### Stem-cell revamp

Stem-cell scientists will be eagerly awaiting updated guidelines for research from the International Society for Stem Cell Research (ISSCR). The ISSCR, a membership organization, last issued guidelines four years ago. The revamp, which will include guidance on studies of human 'embryo-like structures' grown from stem cells *in vitro*, could provide ammunition for lengthening the '14-day rule', which dictates that researchers cannot work with a human embryo produced *in vitro* for more than two weeks after fertilization and is enshrined in law in many countries. Extending the limit could allow scientists to better understand why so many early pregnancies end in miscarriage.

### Crunch time for Alzheimer's drug

US regulators are slated to decide whether the first drug reported to slow down the progression of Alzheimer's disease can be used as a treatment. The drug, aducanumab, made by pharmaceutical company Biogen, is an antibody that binds to a sticky brain protein called amyloid, which most scientists think could be



The James Webb telescope. Its mirror and sunshield will be folded up during launch.

the main trigger for the disease. Evidence that the drug works is mixed. Two phase III clinical trials have offered conflicting results, and an independent advisory panel convened by the US Food and Drug Administration to assess the drug's effectiveness says that the data do not support its use. The only Alzheimer's drugs approved so far treat cognitive symptoms such as memory loss, rather than the progression of the disease.

### Mars gets busy

China's ambitious agenda for space science continues in 2021. A Chinese probe destined for Mars should touch down there in February. The Tianwen-1 mission will look for water and signs of life using 13 instruments, including cameras, radar and particle analysers. If successful, it

will be the country's first exploration of the red planet and the only time a probe carrying an orbiter, lander and rover has touched down there. Craft from the United Arab Emirates and the United States should also arrive at the red planet around the same time.

### Long-awaited telescope launch

October will see the long-awaited launch of the James Webb Space Telescope – which its developer, NASA, calls the "largest, most powerful and complex space telescope ever built". The US\$8.8-billion Webb will seek to repeat the success of the Hubble Telescope, which revolutionized astronomy when it launched in 1990 and has made more than 1.3 million observations since. Webb will cover more wavelengths than Hubble, enabling scientists to peer deeper into the Universe.

### Ripple effect

Radio astronomers could be on the verge of demonstrating a new way of detecting gravitational waves by harnessing pulsating neutron stars as beacons. By precisely timing the signals from these pulsars, teams in Europe, North America and Australia seek to detect long-wavelength ripples produced by pairs of supermassive black holes as they orbit each other at the centres of distant galaxies.

### Brexit unknowns

UK researchers will be able to participate in the European Union's research-funding programme, Horizon Europe, even though the country has left the bloc. The two sides struck an eleventh-hour trade deal on 24 December to determine their post-Brexit relationship, which included 'associate' membership of the €85-billion (US\$104-billion) scheme. The United Kingdom's financial contribution is yet to be decided.



It is unclear whether the Huanan market in Wuhan, China, was ground zero for SARS-CoV-2.

NASA

HECTOR RETAMAL/APP/GETTY