



AARON HUEY/NATIONAL GEOGRAPHIC CREATIVE

Ancient-genome studies could help to explain migration patterns in the Americas and genetic diversity among Native Americans.

RESEARCH

# What to look out for in 2018

*Moon missions, ancient genomes and a publishing showdown are set to shape the year.*

## COSMIC DATA

Fast radio bursts could become much less mysterious when the Canadian Hydrogen Intensity Mapping Experiment (CHIME) begins full operations this year. Astronomers hope to use CHIME to observe tens of these phenomena every day, boosting the current tally of just a few dozen in total. In April, astronomers will pounce on the second data set from the European Space Agency's Gaia mission, which will reveal the position and motion of more than one billion stars in the Milky Way. The data could help to improve our understanding of the spiral structure of the Galaxy.

## ANCIENT AMERICANS

Results from a slew of ancient-genome studies expected in 2018 could help to explain how humans spread across the Americas. Scientists hope to narrow down estimates of when and how people expanded into the region beginning around 15,000 years ago, and to clarify the timing and routes of subsequent migrations. The work might also help to explain the genetic diversity seen in today's Native American populations.

## SCIENTIFIC-UNIT REVAMP

After decades of work, the redefinition of four units of measure should get the go ahead in late

2018. At the General Conference on Weights and Measures in November, delegates from 58 countries will vote on adopting new definitions of the ampere, the kilogram, the kelvin and the mole. These will be based on exact values of fundamental constants, rather than on arbitrary or abstract definitions. If approved, the changes should take effect in May 2019.

## TO THE MOON AND BEYOND

While NASA works on US President Donald Trump's order to send astronauts back to the Moon, two other space agencies will attempt to land rovers on the lunar surface. In early 2018, India's Chandrayaan-2 will mark the country's first attempt at a controlled landing in space. Then, in December, China's Chang'e-4 will become the first probe to target the far side of the Moon. Elsewhere in the Solar System, the Japan Aerospace Exploration Agency's Hayabusa-2 should reach the primitive Ryugu asteroid by July, and NASA's Osiris-Rex is set to reach the asteroid Bennu in late 2018. Both will return samples to Earth in the 2020s.

## CANCER'S BIGGER PICTURE

Insights into the genes that regulate cancer could emerge this year as scientists pore over the first large-scale multiple-cancer sequencing effort of whole genomes. They will also get

results from another large sequencing project, the Cancer Genome Atlas, which will release its analysis of the protein-coding regions — known as the exome — of 33 types of tumour.

## CLIMATE LANDMARKS

Countries that have signed on to the 2015 Paris climate agreement will outline how much progress they have made towards meeting their individual commitments to reduce greenhouse-gas emissions — all in the hope of holding the average global temperature to 1.5–2 °C above pre-industrial levels — as part of a report called the Facilitative Dialogue 2018. The Intergovernmental Panel on Climate Change will also release a special report outlining the consequences of a 1.5-degree temperature increase. And in September, California Governor Jerry Brown will host a major climate conference in support of the Paris agreement.

## EXTREME IMAGING

Expect a raft of studies on how matter evolves under extreme conditions, such as in a planet's core. New tools at X-ray free-electron laser (XFEL) facilities worldwide will enable scientists to image samples changing under high temperature and pressure. Biological and chemical reactions could also become cheaper to study when the first tabletop XFEL facilities open, at

the German Electron Synchrotron near Hamburg and Arizona State University in Tempe.

### POWER PLAY

Midterm elections are approaching in the United States. History suggests that whichever party controls the White House — in this case, the Republicans — is likely to lose seats in Congress. But it's not clear whether Democrats will be able to flip enough positions in the House of Representatives or the Senate to gain a majority in either chamber. Eyes will also be on the record number of scientists running for local, state and federal offices. Elsewhere, the United Kingdom will enter phase two of Brexit negotiations to determine the nation's scientific collaboration with the European Union after the country leaves the bloc in 2019.

### SPACE-INDUSTRY BATTLES

Up to five teams competing for the US\$30-million Google Lunar XPrize have until 31 March to land and manoeuvre the first privately funded rover on the Moon, then beam back images. And aerospace firms Boeing and SpaceX plan to launch their first crewed flights to the International Space Station for NASA by November.



The X-ray free-electron laser (XFEL) facility near Hamburg, Germany.

### DISEASE TREATMENTS

Efforts to bring gene-editing tools such as CRISPR-Cas9 to the clinic are growing. The first phase I trial of CRISPR in people — editing immune cells to tackle lung cancer — will end in April. Firms including Locus Biosciences in Research Triangle Park, North Carolina, and Eligo Bioscience in Paris will work towards trials using engineered viruses called bacteriophages to harness the CRISPR system against antibiotic-resistant bacteria. And the first trial using induced pluripotent stem (iPS)

cells to treat Parkinson's disease is set to begin in Kyoto, Japan, by the year's end.

### PARTICLE SURFING

It's crunch time for a new method of accelerating particles. Scientists with the AWAKE experiment at CERN, Europe's particle-physics lab near Geneva, Switzerland, have shown that the principle behind a proposal to accelerate electrons on a wave of plasma is sound. Now, they must actually do it. If successful, the technique could eventually lead to smaller and cheaper colliders.

### OPEN ACCESS

Who will blink first in the stand-off between German scientists and publishing giant Elsevier? Around 200 German institutions will lose access to Elsevier journals from 1 January until the sides can reach an agreement in a long-running battle over subscription prices. Open-access advocates will also watch the fate of the website Sci-Hub — which provides unauthorized free access to millions of paywalled papers — after a US court order in November shut down some of its domains. ■

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