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RESEARCH

What to watch for in 2019

Climate research, open access and a biosafety rethink are set to shape the year's science.

Elephant seals carrying sensors will help researchers to gather ocean data as part of a massive mission to study Antarctica's Thwaites glacier.

POLAR PROJECTS

In January, US and UK researchers will descend on Antarctica to begin their largest joint mission to the continent in more than 70 years. The aim of the five-year project is to understand whether the remote and seemingly unstable Thwaites Glacier will start to collapse in the next few decades. It includes efforts to study ocean conditions near the Florida-sized glacier using autonomous underwater vehicles and sensors affixed to seals. Later in the year, European scientists plan to start drilling into the ice sheet on Antarctica's Little Dome C in a quest to recover a 1.5-million-year-old ice core. If they're successful, the core will yield the oldest pristine record of climate and atmospheric conditions.

BIG BUCKS

China could emerge as the world's biggest spender on research and development, after adjusting for the purchasing power of its currency, once countries publish their 2018 spending data in late 2019. Outlays on science in China have accelerated since 2003, although the country still trails behind the United States on measures of research quality. Over in Europe, officials will try to agree on how to disburse a proposed €100 billion (US$110 billion) through the European Union's next research-funding programme, Horizon Europe, which begins in 2021. It's unclear how fully UK researchers will be able to participate, as uncertainty over Brexit continues to plague the country.

HUMAN ORIGINS

More fossils illuminating the origins of ancient hominin species could emerge from islands in southeast Asia — a region of intense interest since archaeologists discovered a human-like 'hobbit' species on the Indonesian island of Flores in 2003. Ongoing digs could reveal more about the first human inhabitants of the Philippine island of Luzon, including whether their isolation led to a diminutive stature, similar to what seems to have occurred on Flores.

COLLIDER CRUNCH

It could be a make-or-break year for plans to build a successor to the Large Hadron Collider (LHC). Physicists in Japan proposed hosting the roughly US$7-billion International Linear Collider (ILC) in 2012, after scientists at the LHC in Geneva, Switzerland, announced the discovery of the Higgs boson. The ILC would study the Higgs in detail. But a 2018 report commissioned by the Japanese government failed to support the project, citing its cost. Japan is the only country that has shown interest in hosting the ILC, and the government is expected to issue a statement on whether it will do so by 7 March.

GENE-EDITING FALLOUT

Geneticists will continue to deal with the repercussions of last year's claim by He Jiankui to have helped produce the world's first gene-edited babies. Researchers hope to confirm whether He, a genome-editing researcher at the Southern University of Science and Technology in Shenzhen, China, modified the genes of two embryos that produced twin girls. Following an international outcry, scientists will attempt to uncover any potential side effects of the process, and create a framework to ensure that any future efforts to edit heritable human DNA — such as that in eggs, sperm or embryos — happen in a responsible and regulated way.

PLANNING FOR PLAN S

Subscription journals could shift their business models to accommodate Plan S, the effort to flip scholarly publications to a fully open-access model. Publishers have a year before the scheme's backers will require the researchers they fund to immediately archive papers accepted for publication in free-to-access repositories — a practice that many journals currently forbid. The drive for open science also underpins a 2019 effort by funders and research organizations in the Netherlands that seeks to move away from using citations and impact factors to assess researchers. ▶

BIOSAFETY BIBLE

The World Health Organization expects to finish a major revision of its *Laboratory Biosafety Manual* in mid-2019. The widely used guidelines outline best practices for the safe handling of pathogens such as Ebola. This is the manual's first overhaul since 2004. The revisions will increase the focus on creating site- and experiment-specific risk assessments, and on improving the management, practices and training of lab personnel. The rethink aims to discourage labs from approaching biosafety by rote, and encourage the creation of more flexible and effective procedures.

CARLOS OSORIO/REUTERS

Canada is set to harvest the results of a boom in marijuana research.

CLIMATE TINKERING

As carbon emissions continue to rise, 2019 could see the first experiments that are explicitly aimed at understanding how to artificially cool the planet using a practice called solar geoengineering. Scientists behind the Stratospheric Controlled Perturbation Experiment (SCoPEx) hope to spray 100-gram plumes of chalk-like particles into the stratosphere to observe how they disperse. Such particles could eventually cool the planet by reflecting some of the Sun's rays back into space. Geoengineering sceptics worry that the practice could have unintended consequences and distract from efforts to reduce greenhouse-gas emissions. The US-led SCoPEx team is awaiting the go-ahead from an independent advisory committee.

HIGH HOPES

Researchers in Canada should start to see the first results from a flurry of studies into the cultivation and basic biology of cannabis. In October, the country legalized the plant for all uses — the second nation in the world, after Uruguay, to do so — leading to funding windfalls for marijuana research from provincial and federal governments. By the end of 2019, researchers at the University of Guelph hope to launch Canada's first dedicated academic centre for cannabis research, which will study everything from the plant's genetics to its health benefits.

COSMIC SIGNALS

The world's largest radio telescope — China's Five-hundred-meter Aperture Spherical Radio Telescope — should be fully operational and available to researchers from September. Since the start of its commissioning phase in 2016, the 1.2-billion-yuan (US$170-million) mega-telescope has spotted more than 50 new pulsars: dense, rapidly spinning dead stars. It will soon hunt for the faint signals that emerge from phenomena such as fast radio bursts and clouds of cosmic gas. Meanwhile, astronomers will decide whether to press ahead with building the Thirty Meter Telescope on the Hawaiian mountain Mauna Kea. In 2018, the plans cleared the last of a long series of legal challenges lodged by locals. ■

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