to universities' budgets over several years.

"The government has missed an important opportunity to reverse economy-damaging cuts to university funding, and secure economic growth," says environmental chemist Dianne Jolley at the University of Technology Sydney.

The latest budget does not include more money for the two major research funding agencies — the Australian Research Council and the National Health and Medical Research Council — beyond keeping pace with inflation over the next four years. Neither does it provide a funding boost beyond inflation for the Commonwealth Scientific and Industrial Research Organisation.

Scientists are disappointed that the government has not met the STA's request to allocate money to create an investment fund for non-medical science. In 2015, the government set up a Medical Research Future Fund to invest an estimated Aus$1 billion a year in translating and commercializing basic medical research by 2020. Treasurer Josh Frydenberg says the fund is on track to raise Aus$20 billion by 2020–21. A complementary fund for non-medical research would support the experiments needed to translate scientific discoveries into products or services, says Johnston.

The few winners in science include nuclear-medicine research, with Aus$56.4 million for the Australian Nuclear Science and Technology Organisation over three years. Another Aus$25 million over four years will be provided to Monash University and the University of Melbourne to set up a coastal, environmental and climate research centre near Melbourne.

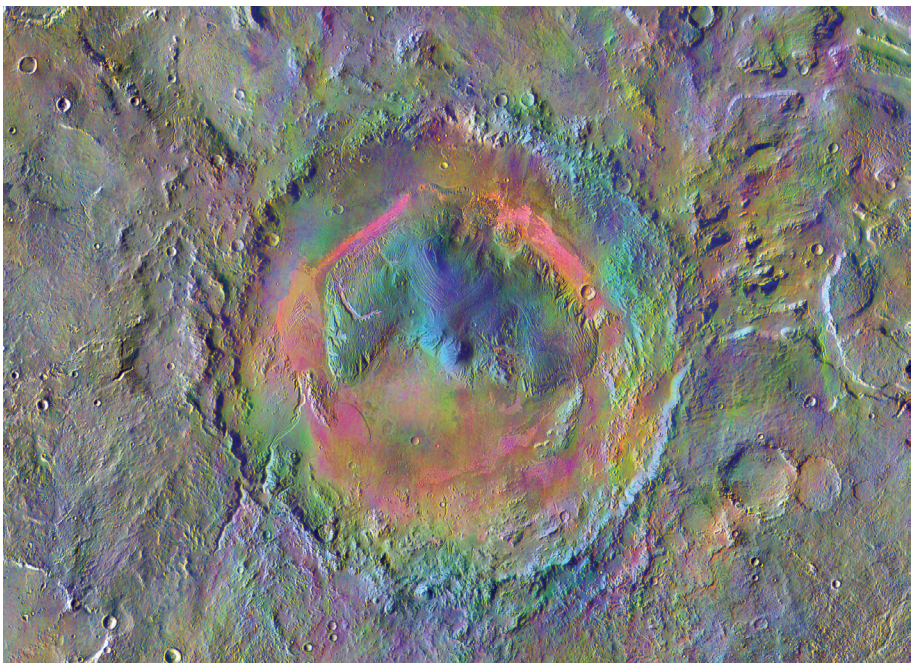
"An investment in coastal science is long overdue," says marine scientist Ruth Reef, who heads the Coastal Research Group at Monash. Coastal habitats are increasingly affected by intensive agriculture, urbanization, sea-level rise and storms, says Reef. Further interdisciplinary research is needed to protect these habitats and improve their management, she says. "Perhaps no habitat is more at risk than the coastal zone."

The government also plans to allocate Aus$3.4 million over four years to support women in science, technology, engineering and mathematics. The money includes Aus$1.8 million for the Science in Australia Gender Equity initiative to attract and retain women in science, which is modelled on the Athena SWAN Charter, a UK higher-education accreditation programme. "Anything is better than nothing, but ten times that amount would have been good," says geneticist Jennifer Graves at La Trobe University in Melbourne.

The small win, she says, will not make up the shortfall from broader, ongoing funding cuts that have reduced universities' capacity to create a healthy academic environment for scientists, especially women. ■

TRACEY NEARMY/GETTY

ASU/JPL-CALTECH/NASA



Gale crater (shown in false colour) is where NASA's Curiosity rover has detected methane.

PLANETARY SCIENCE

Mars data deepen methane mystery

The Trace Gas Orbiter did not find the gas in Mars's atmosphere during its first months of operation.

BY ALEXANDRA WITZE

A spacecraft that was supposed to solve the mystery of methane on Mars has instead compounded scientists' confusion. The European–Russian Trace Gas Orbiter (TGO), which began looking for the gas last year, has yet to find any whiffs of it in Mars's atmosphere, researchers report this week in *Nature*[1].

"It's a huge surprise," says Dorothy Oehler, a planetary geologist at the Planetary Science Institute in Houston, Texas.

Earlier Mars missions have detected hints of methane wafting through the atmosphere. The TGO's failure so far to find the gas suggests that an unknown process is scrubbing much of it from the atmosphere soon after it appears, says Oleg Korablev, a physicist at the Space Research Institute in Moscow and lead author of the study.

Planetary scientists are keen to understand where Martian methane comes from because most methane in Earth's atmosphere is formed by living organisms. Pinning down how much methane is in Mars's atmosphere, and where, would help researchers to determine whether the gas comes from geological sources, such as chemical reactions in rocks, or a more exciting origin — potentially, Martian life.

Scientists have repeatedly spotted methane on Mars over the past 15 years. The reports include telescopic views of a gas plume in 2003 (ref. 2) and, since 2012, occasional detections by NASA's Curiosity rover at Gale crater[3]. The European Space Agency's Mars Express spacecraft has spotted the gas at multiple sites — including a plume near Gale in 2013 (ref. 4).

Aiming to answer the question more definitively, the TGO arrived at Mars in 2016. It began collecting atmospheric data in April 2018. Between April and August of 2018, it found no signs of methane, even though its instruments can detect the gas at concentrations below 50 parts per trillion.

Curiosity sniffed about 500 parts per trillion of methane in mid-June 2018 — at the same time that the TGO flew overhead without seeing any, says Christopher Webster at the Jet Propulsion Laboratory in Pasadena, California, who runs the rover's methane-measuring instrument. Models suggest that any methane plumes should drift upward and mix ▶

into the planet's atmosphere within a few months. "Why do they disappear so quickly?" asks John Moores, a planetary scientist at York University in Toronto, Canada. "There's some piece of the puzzle we are missing."

Researchers are looking for answers in the gap between Curiosity, which sniffs for methane 1 metre above Mars's surface, and the TGO, which takes its best measurements at least 5 kilometres above the planet. The scientists are trying to determine how the gas could be destroyed relatively close to Mars's surface.

One possibility is that methane seeping out of the ground is removed by a low-altitude chemical reaction — perhaps involving dust — before it can drift higher into the air, says Michael Mumma, a planetary scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. A team based at Aarhus University in Denmark, which has studied how dust particles could deplete Martian methane, will describe its ideas on 11 April at the European Geosciences Union meeting in Vienna.

The work is timely because a giant dust storm spread across Mars in June 2018. It obscured the atmosphere and temporarily forced the TGO to focus its methane search on high elevations and latitudes.

Some scientists are sceptical that the TGO will ultimately find the gas. "I've never seen a convincing detection of indigenous methane on Mars, and I don't believe I ever will," says Kevin Zahnle, a planetary scientist at NASA's Ames Research Center in Moffett Field, California, who has argued that reports of Martian methane are observational errors.

But Oehler says that methane probably wafts out of geologically active regions on Mars, such as those riddled with faults. With the only ground measurements coming from Curiosity, scientists simply haven't had the chance to observe how the gas might be seeping from different parts of the surface, or how methane might be destroyed as it drifts upward.

The TGO will continue to monitor Mars's atmosphere through at least 2022. So far, it has observed only a fraction of a Martian year, which lasts nearly two Earth years. Hints of methane might yet emerge as the seasons pass. "One thing about Mars is it's never boring," says Oehler. ■

1. Korablev, O. *et al. Nature* http://doi.org/10.1038/s41586-019-1096-4 (2019).
2. Mumma, M. J. *et al. Science* **323**, 1041–1045 (2009).
3. Webster, C. R. *et al. Science* **360**, 1093–1096 (2018).
4. Giuranna, M. *et al. Nature Geosci.* http://doi.org/10.1038/s41561-019-0331-9 (2019).

MEDICAL RESEARCH

Cancer geneticists tackle ethnic bias in studies

Efforts are under way to fill long-standing gaps in genomic data from minority groups.

BY HEIDI LEDFORD, ATLANTA, GEORGIA

When Bárbara Segarra-Vázquez's breast cancer came roaring back last summer after a 13-year hiatus, her physicians recommended surgery and a genetic test to determine whether chemotherapy was warranted. The test results suggested that she could forgo the drugs, and she did. But a nagging doubt remains.

"They said, 'You don't need chemo.' But do I, or do I not?" says Segarra-Vázquez, dean of the School of Health Professions at the University of Puerto Rico in San Juan, who is Latina. "I don't know, because they didn't test people like me. The validation of that test was done in white Europeans."

Her story illustrates a long-standing bias in cancer research: most studies and genetic databases are populated mainly by data from people of European descent. This knowledge gap exacerbates disparities in cancer incidence and outcomes around the world. In the United States, for example, African American men are about twice as likely as white men to die of prostate cancer.

But researchers who study these inequities say they are encouraged by renewed interest in closing the data gap from their colleagues and funders, including the US government. The issue was unusually prominent at the annual meeting of the American Association for Cancer Research (AACR) this month in Atlanta, Georgia — one of the world's biggest gatherings of cancer researchers.

"It's a historical year for us working in cancer health disparities," says Laura Fejerman, a geneticist at the University of California, San Francisco, who studies breast cancer in Latina women. "We've been trying to show researchers who don't work on health disparities that this is a really important issue."

Differences in cancer risk and survival are thought to be caused by a complex mix of social, economic and genetic factors. The criteria used to select participants for clinical trials are often unintentionally biased against minority ethnic groups — for example, by excluding people with certain disorders that are more common in such populations. And members of these groups are sometimes distrustful of medical researchers, a legacy of past discrimination and studies conducted without adequate consent.

"We still have a long way to go."

Then there is the simple matter of numbers: the rarer a cancer, the harder it is to enrol enough study participants from a minority population to gather statistically meaningful data. A crop of large studies is attempting to address this problem, Fejerman says. They include an effort that the AACR launched last year to sequence the genomes of tumours from 2,020 African Americans by 2020.

Another project, announced last July and about to start recruiting participants, aims to enrol 10,000 African American men recently diagnosed with prostate cancer. The US$26.5-million effort is funded by the US National Institutes of Health and the Prostate Cancer Foundation, a charity in Santa Monica, California. Led by genetic epidemiologist Christopher Haiman of the University of Southern California in Los Angeles, it will examine not only biological features of participants' cancers, but also characteristics of their neighbourhoods and the social stressors — such as discrimination — they have experienced.

"People tend to think that the molecular features of a tumour are everything," says Jennifer Doherty, a cancer epidemiologist at the Huntsman Cancer Institute at the University of Utah in Salt Lake City. "But then we don't remember that the tumour exists within a human being."

A CLOSER LOOK

How genomic data is collected and labelled is also becoming more nuanced, as researchers re-examine the broad ethnic categories they have long used. The term 'Asian' encompasses dozens of countries with disparate lifestyles and genetic backgrounds. Similarly, 'African American' is used to refer to US citizens of African descent, regardless of which region of