ZEPHYR/SPL

A human embryo fertilized *in vitro* is prepared for transfer into the uterus of the mother.

He's premature and risky use of gene-editing in embryos destined for implantation. In late 2019, a Chinese court sentenced He to three years in prison. Earlier this month, the media reported that he had been released.

The He Jiankui "case was a turning point" for research ethics in China, says Haidan Chen, a bioethicist at Peking University in Beijing. In the wake of He's revelations, the government went through a process of self-reflection, holding workshops with researchers and officials across the country on what factors enabled He to do his experiments and what could be done to prevent this from happening again, says Chen.

In late 2019, the Chinese government set up the National Science and Technology Ethics Committee, a high-level group of experts, to oversee governance of research ethics. The statement "is the first public, finalized" result of those efforts, says Xiaomei Zhai, a bioethicist at the Chinese Academy of Medical Sciences in Beijing, who is a member of the committee.

A key issue that emerged from the committee's consultations was the existence of numerous ethics guidelines for different research fields, and inconsistencies between them, which created confusion, says Zhai. For example, He's research using genome editing was overseen by the science ministry, but then he implanted genome-edited embryos into women, procedures that are overseen by the health ministry. This patchwork of regulations made it easier for He to do what he did, because it wasn't clear which authority was responsible for regulating his work.

The latest statement seeks to address this by covering all areas of research. The document also calls for better ethics training, especially for young scientists, and encourages public engagement and debate. "It's a good starting point," says Chen. But similar ideas have been proposed in the past, and there is no guarantee that researchers will follow them, says Chen: "The most important thing is how we implement" them.

Strong warning

The document places primary responsibility for ethics governance on institutions, but also calls for the establishment of a science and technology ethics association, which could have a role. "This is really refreshing," says Joy Zhang, a sociologist at the University of Kent in Canterbury, UK. Academic associations in China have conventionally had a limited role in regulatory discussions, but they could help to enforce ethical norms, she says.

The document states that funding agencies, institutions and industry should assess violations and impose punishments — including recovering funds, revoking awards and professional qualifications, and prohibiting access to public funds — in accordance with existing laws. In the past, researchers might have done ethically questionable research thinking that there was little chance of being penalized, says Chen. Now they know they will be punished severely, she says.

But some researchers worry that the statement might deter those wanting to engage in valuable research topics that can be conducted responsibly but could raise ethical questions, says Nie. "They will say, 'I will not bother because I do not want to get in trouble.'"

Nie adds that more work is needed to ensure that the more detailed guidelines that follow the government's statement allow scientists to report and resist unethical behaviour. "We know universally, worldwide, whistle-blowers are often punished in various ways."

Zhai agrees that the hard work is ahead. The science and technology ethics committee now plans to coordinate with ministries and research institutions to ensure that their policies align with the national policy. The committee has also been tasked with creating a list of activities deemed high-risk, and has asked for suggestions from scientists. This research, which could include topics from stem cells to chimaeras and nanomedicine, will be regulated through more stringent ethical reviews, and the application of these technologies will be treated with caution, says Zhai.

AEROPLANE TELESCOPE FACES SHUTDOWN AFTER YEARS OF PROBLEMS

NASA and German space agency ground costly instrument.

By Alexandra Witze

NASA and the German Aerospace Center are permanently shutting down the Stratospheric Observatory for Infrared Astronomy (SOFIA), a telescope on an aeroplane that has been scrutinized for years because of its high cost and low scientific output. Since 2014, the observatory has made hundreds of flights above the water vapour in Earth's atmosphere to get an unobscured view of celestial objects and to gather data at infrared wavelengths.

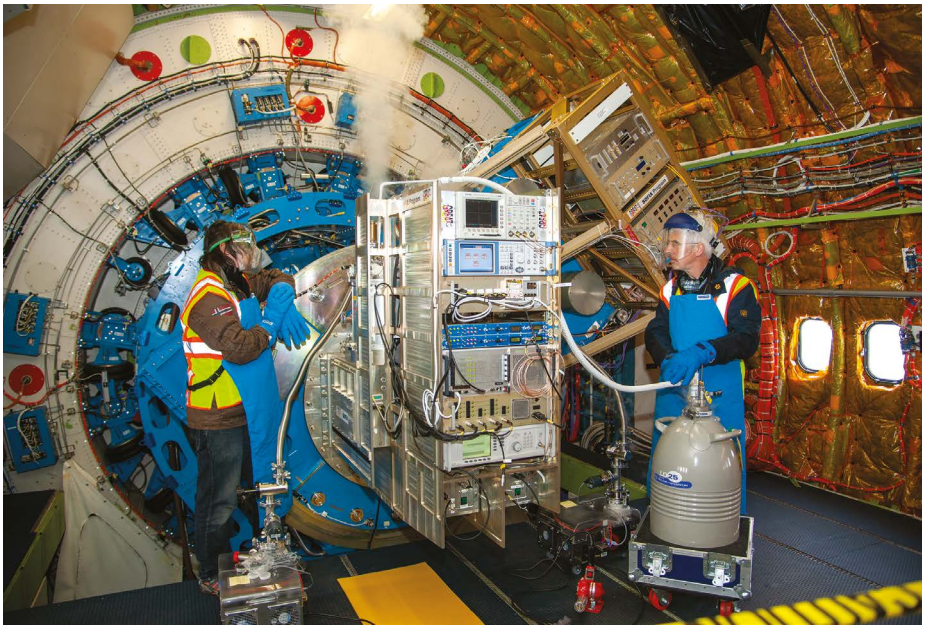
SOFIA has measured magnetic fields in galaxies[1], spotted water on sunlit portions of the Moon[2] and detected the first type of ion that formed in the Universe, helium hydride[3]. But it costs NASA around US$85 million a year to operate, which is nearly as much as the Hubble Space Telescope. On 28 April, NASA and the German Aerospace Center, the two partners in SOFIA, announced that they will close down the observatory by 30 September.

SOFIA's high price tag, combined with its

relatively low scientific output until recently, earnt it a low ranking in last year's decadal survey of the future of US astronomy and astrophysics. NASA cited the survey's recommendation to shutter SOFIA — put forward by the astronomy community — when it announced its decision. The observatory was originally meant to have a 20-year lifetime, but it will now be decommissioned after only 8 years.

"It's a very difficult decision, and certainly very painful for everyone who has worked on the mission," says John O'Meara, chief scientist at the W. M. Keck Observatory in Kamuela, Hawaii, who has worked on long-term plans for astronomy and astrophysics in the United States. But "it's the right call".

SOFIA costs more to run each year than many of NASA's other astrophysics missions combined. The German Aerospace Center contributes 20% of operating costs. The observatory is expensive because, unlike space telescopes, it requires pilots and a staff to fly and fuel it.



CARLA THOMAS/NASA

Technicians cool one of SOFIA's instruments with liquid nitrogen in 2013.

'Globally unique'

SOFIA is a Boeing 747 with a hole cut in its side to accommodate a 2.5-metre-wide, 17-tonne telescope, which peers out at the Universe as the plane flies at altitudes of between about 11 and 14 kilometres. It has made approximately 800 scientific flights since it became operational in 2014. The plane flies mainly from its home base in Palmdale, California, although it has also been deployed in locations including Germany, Chile and New Zealand — the latter two to observe celestial objects that are visible only from the Southern Hemisphere.

SOFIA collects data that are not gathered by either ground-based observatories or space-based infrared telescopes, such as the James Webb Space Telescope, which was launched last year. It is the only observatory that can currently make observations at some far-infrared wavelengths. "SOFIA is globally unique," said Walther Pelzer, head of the German space agency, in a statement announcing its closure.

SOFIA's scientific output has long been questioned. In 2019, a pair of NASA-commissioned reviews highlighted that the observatory had not resulted in large numbers of highly cited publications. In the first 6 years after operations began, its data led to 178 scientific papers, compared with more than 900 from Hubble's first 6 years.

In response to the reviews, SOFIA brought in a new director, Margaret Meixner, and ramped up its focus on scientific productivity. "SOFIA has been transformed over the last three years," Meixner says, with its annual publication rate doubling over that period. She says that its scientific output is comparable to that of the European Space Agency's Herschel Space Observatory, which was the most recent space telescope to operate at far-infrared wavelengths, and that SOFIA's science addresses many of the priorities for future research that are laid out in the decadal survey.

Asked whether NASA had taken recent SOFIA discoveries into account when making its decision, agency spokesperson Alise Fisher pointed to the decadal survey, which states that it "found no evidence that SOFIA could, in fact, transition to a significantly more productive future".

Charles Woodward, an astronomer at the University of Minnesota in Minneapolis, says that SOFIA's closure has led to a feeling of "melancholy" among infrared astronomers, given that its productivity had been rising. "A significant portion of the community will think that SOFIA got the short end of the stick," he says.

In recent years, several budget requests from US presidents have recommended terminating SOFIA. In each case, Congress — usually led by House of Representatives minority leader Kevin McCarthy, who represents a district near Palmdale — provided funds to keep it going. The latest decision might render congressional wishes moot.

Between now and 30 September, SOFIA is scheduled to make its final observations, possibly including a deployment to New Zealand. NASA and the German space agency will then decommission the aeroplane.

JOSHUA FISHER/NASA

The SOFIA telescope on an aeroplane will make its final observations by 30 September.

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3. Güsten, R. *et al. Nature* **568**, 357–359 (2019).