claimed experiments for an article in *MIT Technology Review*. "The data I reviewed are consistent with the fact that the editing has, in fact, taken place," says Urnov, who is based at the Altius Institute for Biomedical Sciences in Seattle, Washington. But he adds that the only way to tell whether the children's genomes have been edited is to independently test their DNA.

Urnov takes issue with the decision to edit an embryo's genome to prevent HIV infection. He is also using genome-editing tools to target the *CCR5* gene, but his studies are in people with HIV, not embryos. He says that there are "safe and effective ways" to use genetics to protect people from HIV that do not involve editing an embryo's genes.

Paula Cannon, who studies HIV at the University of Southern California in Los Angeles, also questions He's decision to target that gene in embryos. She says that some strains of HIV don't even use this protein to enter cells, they use another protein called CXCR4. Even people who are naturally CCR5-negative are not completely resistant to HIV, Cannon adds, because they could be infected by a CXCR4 strain.

She also says it makes no sense that He recruited families with an HIV-positive father, as was the case with the twins, because there is no real risk of transmission to the children.

"This experiment exposes healthy normal children to risks of gene editing for no real necessary benefit," says Julian Savulescu, director of the Oxford Uehiro Centre for Practical Ethics at the University of Oxford, UK.

In an interview with the Associated Press, He said the goal of the work was not to prevent transmission from the parents, but to offer couples affected by HIV a chance to have a child that might be protected from a similar fate. But years of research is needed to show that meddling with the genome of an embryo is not going to cause harm, says Joyce Harper, who studies women's and reproductive health at University College London. Legislation and public discussion should also occur before genome editing is used in embryos destined for implantation.

"This is a huge blow to the international reputation and the development of Chinese science."

Southern University of Science and Technology said in a statement on 26 November that it was unaware of He's experiments, that the work was not performed at the university and that He has been on leave since February. The university says its researchers must abide by national laws and regulations, and respect international academic ethics and academic standards. It will set up an independent committee to investigate the matter.

Making gene-edited babies goes against regulations released by China's health and science ministries in 2003, but it is not clear whether there are penalties for those who break the rules.

More than 100 Chinese biomedical researchers posted a strongly worded statement online condemning He's claims. "Directly jumping into human experiments can only be described as crazy," the statement reads. The scientists call on Chinese authorities to release the findings of any investigation to the public.

"This is a huge blow to the international reputation and the development of Chinese science, especially in the field of biomedical research," the statement says. "It is extremely unfair to the large majority of diligent and conscientious scientists in China who are pursuing research and innovation while strictly adhering to ethical limits."

Nature tried to contact He but did not receive a response before its deadline. In his video, He says he supports the use of genome editing in embryos only in cases that relate to disease. "I understand my work will be controversial, but I believe families need this technology and I am willing to take the criticism for them," he says.

News of the experiment came a day before researchers in the field gathered in Hong Kong for a major international meeting on genome editing, running from 27 to 29 November. Even before the news of He's work emerged, many in the field thought it was inevitable that someone would use genome-editing tools to make changes to human embryos for implantation into women, and had been pushing for an international consensus on how genome editing to modify eggs, sperm or embryos should proceed. ■

PLANETARY SCIENCE

'Marsquake' hunter begins to probe planet's innards

Joint US–French–German mission will monitor seismic activity on Mars.

BY ALEXANDRA WITZE

Earthlings are about to hear Mars's heartbeat.

On 26 November, NASA's InSight mission touched down near the Martian equator and embarked on the first mission dedicated to listening for seismic energy rippling through the red planet.

Any 'marsquakes' InSight detects could yield clues about the planet's mysterious interior, including how it is separated into a core, mantle and crust. Whatever scientists learn about Mars's innards could help to illuminate how our own planet evolved billions of years ago.

InSight had been cruising through space since its launch in May, tracked by mission control at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California. On Monday, just before 11:53 a.m. local time, the spacecraft entered the Martian atmosphere at nearly 20,000 kilometres per hour.

As it neared Mars's surface, the spacecraft demonstrated a new way to communicate with its controllers on Earth, 146 million kilometres away. Two 'cubesats', each the size of a briefcase, relayed information from InSight to Earth in close to real time. The experiment suggests that miniature satellites like these could allow faster communication with probes in deep space.

InSight landed at Elysium Planitia, a broad, flat region just north of the Martian equator. It is one of the most boring places on the planet, says Bruce Banerdt, a planetary scientist at JPL and the US$994-million mission's principal investigator. That's an advantage for InSight, which needs a safe, geologically stable place to do its work.

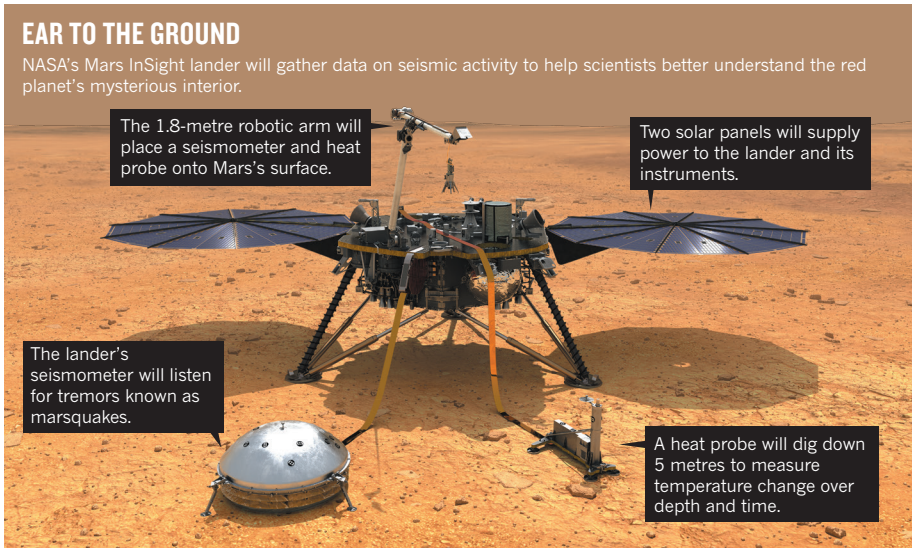
The first photo that InSight sent from the surface of Mars showed a flat, relatively rock-free landscape stretching to the horizon, with the foreground speckled with dust from the landing.

"It's happy. The lander is not complaining," said Rob Manning, chief engineer at JPL, shortly after InSight touched down.

LISTENING IN

Mission scientists will use the lander's camera to scout the ground for the smoothest and most level area to deploy its French-built seismometer (see 'Ear to the ground'). InSight's robotic arm will pluck the instrument off its back and place it on the ground, then put a

NASA/JPL-CALTECH



dome-shaped wind shield over it. The whole process is expected to take several days.

The seismometer includes three ground-motion sensors nested inside a vacuum, and its sensitivity allows it to detect movement as small as the width of an atom. The big challenge will be determining which movements are caused by marsquakes and which are the result of jostling by the wind or other sources. On the third day after landing, project scientists will switch on an instrument to track changes in the magnetic field, which will help them to identify sources of noise that aren't quakes, says Catherine Johnson, a geophysicist at the University of British Columbia in Vancouver, Canada.

InSight won't deploy its German-built heat-flow probe until January. Over the course of several weeks, the instrument will drill five metres into the Martian surface, deeper than anything achieved before. Scientists will track changes in temperature as small as a few hundredths of a degree. That will tell them how much heat is leaving Mars, and how many heat-producing radioactive elements are packed inside it.

InSight is meant to work for a little more than one Martian year, equivalent to almost two Earth years. It should measure 50–100 marsquakes during that period, says Banerdt. The longer it survives, the more it will be able to detect — and the more researchers will be able to deduce about Mars's internal structure. ■

PUBLISHING

The age of AI peer reviews

Automated software can help review papers, but the decision-making stays with humans.

BY DOUGLAS HEAVEN

Most researchers have good reason to grumble about peer review: it is time-consuming and error-prone, and the workload is unevenly spread, with just 20% of scientists taking on most reviews.

Now peer review by artificial intelligence (AI) is promising to improve the process, boost the quality of published papers — and save reviewers time. A handful of academic publishers are piloting AI tools to do anything from selecting reviewers to checking statistics and summarizing a paper's findings.

In June, software called StatReviewer, which checks that statistics and methods in manuscripts are sound, was adopted by Aries Systems, a peer-review management system owned by Amsterdam-based publishing giant Elsevier. And ScholarOne, a peer-review platform used by many journals, is teaming up with UNSILO of Aarhus, Denmark, which uses natural language processing and machine learning to analyse manuscripts.

UNSILO uses semantic analysis of the manuscript text to extract what it identifies as the main statements. This gives a better overview of a paper than the keywords typically submitted by authors, says Neil Christensen, sales director at UNSILO. "We find the important phrases in what they have actually written," he says, "instead of just taking what they've come up with five minutes before submission."

UNSILO identifies which of these key phrases are most likely to be claims or findings, giving editors an at-a-glance summary of the results. It also highlights whether the claims are similar to those from previous papers, which could be used to detect plagiarism or simply to place the manuscript in context with related work in the wider literature. "The tool's not making a decision," says Christensen. "It's just saying: 'Here are some things that stand out when comparing this manuscript with everything that's been published before. You be the judge.'"

"It doesn't replace editorial judgement but, by God, it makes it easier."

"It doesn't replace editorial judgement but, by God, it makes it easier," says David Worlock, a UK-based publishing consultant who saw the UNSILO demonstration at the Frankfurt Book Fair in Germany last month.

Worlock notes that there are several similar tools emerging. He is on the board of Wizdom.ai in London, a start-up owned by publishers Taylor & Francis, which is developing software that can mine paper databases and extract connections between different disciplines and concepts. He says that this kind of tool will be useful beyond peer review, for tasks such as writing grant applications or literature reviews.

Many platforms, including ScholarOne, already have automatic plagiarism checkers. And services including Penelope.ai examine whether the references and the structure of a manuscript meet a journal's requirements. Some can flag up issues with the quality of a study, too. The tool statcheck, developed by Michèle Nuijten, a methodologist at Tilburg University in the Netherlands, and her colleagues, assesses the consistency of authors' statistics reporting, focusing on *P* values. The journal *Psychological Science* runs all its papers through the tool, and Nuijten says that other publishers are keen to integrate it into their review processes.

When Nuijten's team analysed papers published in psychology journals, they found that roughly 50% contained at least one statistical inconsistency (M. B. Nuijten *et al. Behav. Res. Meth.* **48**, 1205–1226; 2016). In one in eight papers, the error was serious enough that it could have changed the statistical significance of a published result. "That's worrisome," she says. She's not surprised that reviewers miss such mistakes, however. "Not everyone has time to go over all the numbers. You focus on the main findings or the general story."

For now, statcheck is limited to analysing ▶