

► Washington, is a global health charity that spent \$4.6 billion in 2016, much of it allocated to research. Each year, more than 2,000 papers are published from projects it funds. The foundation stipulates that these papers, and their data, must be made open.

It's not the only research funder to have such rules, but its policy is stricter than most, because it demands that papers are made free to read immediately on publication, rather than permitting a six-month delay as some subscription journals require. And the papers must not only be free to read, but also be posted under a 'CC-BY' licence that allows their contents to be reused without restrictions, for example through republication, even for commercial purposes. When the Gates policy came into force at the beginning of 2017, it clashed with the rules of subscription journals including *Nature*, *Science*, *NEJM* and *PNAS*, meaning that researchers could not publish Gates-funded work in these journals.

In February that year, however, the AAAS and Gates announced their partnership. On 1 March, *NEJM* changed its own policy. The medical journal generally makes articles free to read on its website six months after publication, but it agreed to make Gates-funded

articles free to read immediately, says Jennifer Zeiss, communications and media-relations manager for the NEJM Group. It also agreed to simultaneously make available a CC-BY licensed 'author final version' of the paper, which includes revisions made after peer review but lacks final *NEJM* editing. These appear online in the PubMed Central database. "At present time, *NEJM* does not have this arrangement with other funders," Zeiss says.

And in September 2017, *PNAS* — which also already makes papers free to read on its site six months after publication — began offering an OA option under a restrictive licence that does not permit commercial reuse or republication. The journal also decided to offer a liberal CC-BY licence for authors whose funders mandate it, a spokesperson says.

*Nature* does not have a specific OA policy for Gates grant holders, but the issue is still under discussion, and the journal does occasionally publish papers, which can include those with Gates funding, under a CC licence,

**"If Gates had refused to pay the prestige tax, it would not have lost grant applications."**

says a spokesperson for Nature Research, the portfolio of journals that includes *Nature*. The journal has published more than 30 CC-BY OA papers since 2017, according to an analysis by *Nature*'s news team, including the two by Gates-funded researchers.

Peter Suber, director of the Harvard Open Access Project and the Harvard Office for Scholarly Communication in Cambridge, Massachusetts, characterizes the AAAS pilot as a compromise whereby Gates paid the publisher a "prestige tax" for the specific OA terms it wanted.

"To me, the deal was unnecessary and undesirable. A wide range of high-quality journals were already compatible with the Gates publishing terms. If Gates had refused to pay the AAAS prestige tax, it would not have lost grant applications from first-rate researchers," Suber says. "I'm glad to see it come to an end."

Other funders haven't imposed terms as stringent as Gates's, notes Stephen Curry, a structural biologist at Imperial College London, but he praises the stance. "Gates are right to stipulate immediate OA as a condition of funding, especially in an area of such importance to global public health." ■

## ASTRONOMY

# Ten new moons spotted orbiting Jupiter

Planet now has 79 known satellites, including one on a collision course with its neighbours.

BY ALEXANDRA WITZE

Astronomers have discovered 10 small moons orbiting Jupiter, bringing its total to 79 — by far the most moons known around any planet. One of the finds is an oddball that moves in the opposite direction from its neighbours.

Together, the moons help to illuminate the Solar System's early history. The existence of so many small satellites suggests

that they arose from cosmic collisions after Jupiter itself formed, more than 4 billion years ago.

"They did not form with the planet, but were likely captured by the planet during or just after the planet-formation epoch," says Scott Sheppard, an astronomer at the Carnegie Institution for Science in Washington DC. He and his colleagues announced the discovery on 17 July.

Sheppard's team typically hunts for objects

in the very distant Solar System, out beyond Pluto, and sometimes spots planetary moons during these searches. Last year, the group reported two additional Jovian moons. In this case, the scientists were looking for a putative unseen massive planet popularly known as Planet Nine. Jupiter was in the same part of the sky, so they were able to hunt for moons as well.

To discover new Solar System bodies and calculate their orbits, the researchers

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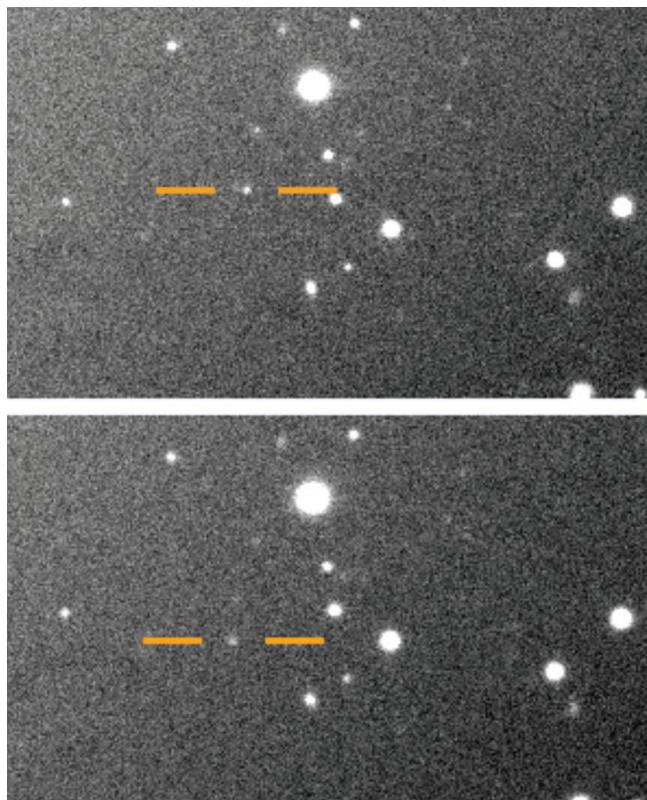
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NASA photograph the same part of the sky weeks or months apart. They then look for objects that shift position between the two images, relative to the background stars. The team first spotted most of the new Jovian moons using the Blanco 4-metre telescope at the Cerro Tololo Inter-American Observatory in Chile, and followed up with further observations at other telescopes.

#### STRANGE SATELLITES

All the newfound moons are small, between about 1 and 3 kilometres across. Seven of them travel in remote orbits more than 20 million kilometres away from Jupiter, and in the opposite direction from the planet's rotation. That puts them in the category known as retrograde moons.

The eighth moon stands out because it travels in the same region of space as the retrograde moons, but in the opposite direction (that is, in the same direction as Jupiter's spin). Its orbit is also tilted with respect to those of the retrograde moons. That means it could easily smash into the retrograde moons, pulverizing itself into oblivion. It may be the leftovers of a bigger cosmic collision of this nature in the past, Sheppard says.



These images show the movement of the Jovian moon dubbed Valetudo (labelled in yellow) relative to the background stars.

Jupiter's moons are named after gods with connections to the mythological deities Jupiter or Zeus. Sheppard has proposed naming the oddball Valetudo, after

one of Jupiter's descendants, the Roman goddess of hygiene and health.

The ninth and tenth newfound moons orbit closer to Jupiter, moving in the same direction as the planet.

Had all these small moons formed at the same time as Jupiter, they probably would have been captured by the gas and dust still swirling around the newborn planet, and have been engulfed. Their existence suggests that they are leftovers of later collisions between space rocks that left the debris encircling Jupiter.

If astronomers can work out the history of these collisions, they could also determine the sizes of any satellites that were pulled into the orbit of a young Jupiter. "That's the big question, and that's what makes these ten new moons interesting," says Douglas Hamilton, an astronomer at the University of Maryland in College Park. "How can we link all this to how planets formed?"

Sheppard says there might still be a few more moons of Jupiter to discover — as yet unseen because they were hiding in the Sun's glare when the scientists were looking. Saturn, the runner-up to Jupiter in the moon competition, has 62 known satellites. ■

#### MEDICAL RESEARCH

# Gene therapy in mouse fetuses treats deadly disease

*The method could minimize damage from disease if a condition is diagnosed in utero.*

BY HEIDI LEDFORD

**G**ene therapy administered in the womb could be used to treat a deadly genetic disease, a study in fetal mice suggests.

The results could add to the increasingly popular approach of using prenatal gene therapy to minimize the damage wrought by some genetic diseases. The US Food and Drug Administration approved the first gene therapy for adults and children last year, and more treatments are crowding pharmaceutical pipelines around the world.

Simon Waddington, the lead author of the latest study, says he used to meet with shocked stares when he talked about treating fetuses

with gene therapy. "It had gotten to the point where I'd given up on telling people that fetal gene therapy is a good idea," says Waddington, who studies gene therapy at University College London. "And now, not infrequently, people turn to me and say, 'You know what would be a good idea? Fetal gene therapy.'"

The mouse study, published on 16 July in *Nature Medicine*<sup>1</sup>, uses prenatal gene therapy to tackle a condition — acute neuronopathic Gaucher's disease — caused by mutations in a gene called *GBA*. These mutations disrupt the breakdown of a particular fatty molecule, or lipid. As a result, the lipid accumulates in brain cells and other parts of the body, contributing to organ dysfunction.

The study looks at whether the disease can be treated by using a virus to supply normal copies of *GBA* to a developing fetus. That could minimize the irreparable brain damage that arises as the lipid accumulates.

Some forms of Gaucher's disease can be treated by supplying normal copies of the *GBA* enzyme to break down lipids, but that enzyme cannot cross from the blood into the brain. Children with acute neuronopathic Gaucher's disease rarely live past two years.

#### DIFFICULT CROSSING

The condition is so devastating that colleagues were sceptical about his team's ability to treat it, says Waddington. "People told me, ▶