research team says it could help other threatened species, too — including Tasmanian devils and corals on the Great Barrier Reef.

In the 80 years since agriculture officials introduced the cane toad (*Rhinella marina*) to northeastern Australia to control a sugar-cane-devouring beetle, the amphibians have spread across the state of Queensland, the Northern Territory and large chunks of Western Australia. Their rapid advance has devastated northern-quoll populations, which have shrunk by more than 75%.

Ecologists Ella Kelly and Ben Phillips knew from their previous research that some quoll populations in Queensland had developed an aversion to the toads over the years (E. Kelly and B. L. Phillips *Behav. Ecol.* **28**, 854–858; 2017). The researchers, both at the University of Melbourne, wondered whether the trait could be successfully bred into vulnerable quoll populations that cane toads hadn't yet reached. That could make those 'naive' quolls more resilient to toad invasions, if enough animals in a given group have the trait.

To test this idea, the scientists bred animals in captivity, mixing northern quolls from a toad-infested area of Queensland that displayed an aversion to toads with naive quolls from a toad-free island in the Northern Territory. Kelly and Phillips then exposed the resulting offspring to a toad leg to gauge whether the young quolls recognized the threat. They found that most of the young quolls wouldn't touch the toad legs.

The finding suggests that the trait is inherited, rather than taught by mother quolls, and may be dominant, the researchers say. "That's the first hurdle that needs to be jumped in showing targeted gene flow," Phillips says. "Without a genetic basis, there is no point in introducing [toad-smart quolls] into the population. And we found there is a genetic basis."

The captive-quoll study is an important step towards demonstrating that targeted gene flow is a viable strategy to aid quoll conservation, says Sarah Fitzpatrick, a conservation biologist at Michigan State University's Kellogg Biological Station in Hickory Corners. "Many behaviours are plastic, and therefore are not necessarily controlled by certain genes," she says. "If this were the case for toad-eating behaviour, targeted gene flow would not work."

Buoyed by the results of the captive study, Kelly and Phillips, along with University of Melbourne colleague Chris Jolly, decided in May 2017 to see whether toad-smart and naive quolls would produce toad-smart offspring in the wild. They released 54 quolls on toad-infested Indian Island — a mix of naive Northern Territory quolls, toad-averse quolls from Queensland and hybrid offspring.

When the researchers returned in April this year to check on the quolls, they found good and bad news. Many fewer quolls survived than the team had anticipated — just 16 animals, according to the researchers' population estimate. But encouragingly, the group included offspring that seemed to be toad-smart, which would suggest that they had inherited the trait from their parents. The team is now analysing genetic samples taken from the survivors.

Kelly and Phillips plan to return to the site again next April, to see how the remaining quolls fare.

As the experiment continues, the pair is seeking permission from wildlife officials in Western Australia to introduce northern quolls with the toad-smart trait into populations in the path of the cane-toad diaspora to gird them against future invasions. "It would be a tragedy not to try," Phillips says. ■

ASTRONOMY

NASA aims for Sun's corona

The Parker Solar Probe will make humanity's closest approach to its home star.

BY ALEXANDRA WITZE

Step aside, Icarus: NASA has made a spacecraft that can fly through the Sun's atmosphere without melting.

On 6 August, if all goes to plan, the US$1.5-billion Parker Solar Probe will lift off from a launch pad at Florida's Cape Canaveral. Just three months later, it will whizz much closer to the Sun than any spacecraft has ever come, to take the first-ever direct measurements of the star's maelstrom of energy.

But that's just the beginning. Over the next 7 years, the craft will loop around the Sun another 23 times, passing nearer and nearer — ultimately flying about 6.2 million kilometres above the surface, well within the solar corona. That's nearly seven times closer than the record mark set by the German Helios 2 spacecraft in 1976.

The Parker Solar Probe aims to answer some of the biggest outstanding questions about the Sun, such as how its corona is heated to millions of degrees while the surface beneath it stays relatively cool[1]. The spacecraft will also visit the birthplace of the solar wind, a flood of energetic particles that streams out into the Solar System at speeds of up to 800 kilometres a second. When the solar wind slams into Earth, it generates beautiful polar aurorae, but it can also disrupt satellite communications and navigation systems.

"We're going to be right where all the interesting stuff happens," says Nicola Fox, a solar physicist at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Maryland, and the mission's project scientist.

Data from the deep-diving probe should allow researchers to improve their understanding of the complex picture of how particles, magnetic fields and energy combine in the Sun. "This is going to be such a game-changer," says Nicholeen Viall, a solar physicist at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

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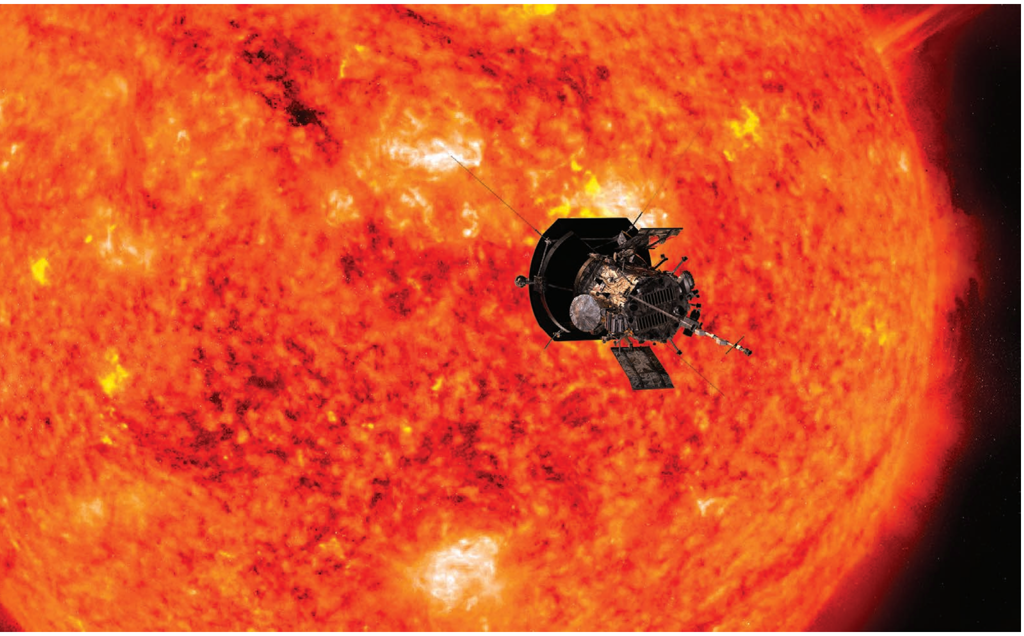
JHUAPL
The Parker Solar Probe will travel seven times closer to the Sun's surface than any previous spacecraft.

Space physicists have dreamt of a mission that would fly through the solar corona, or at least travel inside the orbit of Mercury, the innermost planet, since 1958. In the same year, Eugene Parker — the physicist at the University of Chicago in Illinois for whom the probe is named — first proposed the existence of the solar wind[2].

After decades on the drawing board, the mission is finally approaching launch. Eight weeks after lift-off, it will fly past Venus, using the planet's gravity to slow down and slip into a tighter orbit around the Sun. Five weeks after that, on 3 November, the probe will make its first close approach — at more than 24 million kilometres, or 35 times the solar radius, from its surface.

From there, the spacecraft will loop around the Sun, drawing gradually closer as it flies past Venus six more times. That trajectory will give the probe ample time to gather data, says Yanping Guo, an engineer at APL who designed the mission's trajectory.

Somewhere between the first close approach (at 35 solar radii) and its final ones (within 10 solar radii) the probe will encounter the Alfvén surface, a boundary at which the solar wind becomes supersonic. Inside the Alfvén surface, the Sun's magnetic field dominates; outside, the solar wind is more detached and streams away on its own.

Crossing that boundary with a spacecraft will be similar, symbolically, to the moment when the Voyager 1 probe entered interstellar space in 2012, says Justin Kasper, a physicist at the University of Michigan in Ann Arbor who has studied the Alfvén transition[3]. The moment will mark humanity's passage to another realm in the Solar System. "I'm confident that something special will happen," he says.

The Parker Solar Probe bristles with an array of instruments designed to sample the corona directly. Protecting them is a 2.4-metre-wide heat shield made of 11-centimetre-thick carbon foam sandwiched between layers of carbon composite. It can withstand temperatures of nearly 1,400 °C. The solar panels that power the spacecraft will be kept cool with a water-tubing system similar to a car's radiator. During the searing conditions of close approach, most of the solar panels will fold back to shelter in the heat shield's shade.

Mission scientists hope that the Parker Solar Probe will kick off a new era of studying the Sun. In 2020, the European Space Agency plans to launch its Solar Orbiter spacecraft, which will study the Sun at higher latitudes and from a more distant point in space than the Parker Solar Probe will. Also by 2020, the Daniel K. Inouye Solar Telescope will come online in Hawaii, where it will make daily maps of the solar corona.

For his part, the 91-year-old Parker is looking forward to seeing the waves and turbulence in the solar wind — which he predicted — measured by the probe that bears his name. "I expect to find some surprises," he says. ■

1. Fox, N. J. *et al. Space Sci. Rev.* **204**, 7–48 (2016).
2. Parker, E. N. *Astrophys. J.* **128**, 664–676 (1958).
3. Kasper, J. C. *et al. Astrophys. J.* **849**, 126 (2017).

FUNDING

Philippines sweetens deal for scientists who return home

But some academics say more needs to be done to train and retain early-career researchers.

BY ANDREW SILVER

A renewed government effort to draw Filipino scientists back to the Philippines by paying them to set up their own research labs or teach has met with a mixed reception.

Some Filipino researchers applaud the goals of the effort. The government says it needs to bring research expertise back home to solve some of the country's most pressing problems, such as climate-change mitigation.

Others suggest that resources would be better directed to mentoring early-career scientists before they think about leaving. "If you want Filipino scientists, you grow them," says Vena Pearl Bongolan, an applied mathematician at the University of the Philippines Diliman in Quezon City.

An existing project designed to address the issue is the Balik Scientist Program, established in the 1970s. Since 1993, it has offered research grants for up to three years, as well as round-trip airfare and duty-free equipment imports, to Filipino scientists willing to return home.

Last month, President Rodrigo Duterte signed a law that instructs the Department of Science and Technology to allocate more money to the Balik programme by adding benefits for returning scientists, such as a monthly housing allowance, medical insurance and assistance for researchers' children to attend schools of their choice. Between 2007 and April 2018, 207 scientists joined the Balik programme, some for stints of a couple of months and others for several years. ▶