extreme weather would reduce barley yield by between 3% and 17%. Some countries fared better than others: tropical areas such as Central and South America were hit badly, but crop yields increased in some temperate areas, including northern China and the United States. But this was not enough to offset the global decrease.

Finally, Guan and his colleagues fed these changes in barley yield into an existing economic model to look at how reduced barley production would affect pricing and consumption of beer. In the worst-case scenario, the reduced barley supply would result in doubling of prices and a 16% decrease in beer consumption in the years of extreme-weather events (see 'Climate's toll on beer').

Klaus Hubacek, an ecological economist at the University of Maryland in College Park, says that the study does a good job of combining climate, agriculture and economics models. He wonders how other alcohol crops might be affected, and whether beer drinkers might switch to cider or other alcoholic drinks.

But worries about beer pale in comparison to projections of how climate change could harm food security generally, says David Reay, a climate-change scientist at the University of Edinburgh, UK. "The effect on beer is going to be the least of our worries," he says, especially in the worst-case climate scenarios. Reay worries this message could be diluted in studies such as Guan's, which concentrate on luxury items.

"I think in that kind of future, I probably will need a beer, because it will be pretty bad," Reay says. ■

SPACE

Mercury probes ready to begin seven-year journey

BepiColombo, a joint Europe–Japan mission, is only second ever mission to the planet.

BY DAVIDE CASTELVECCHI

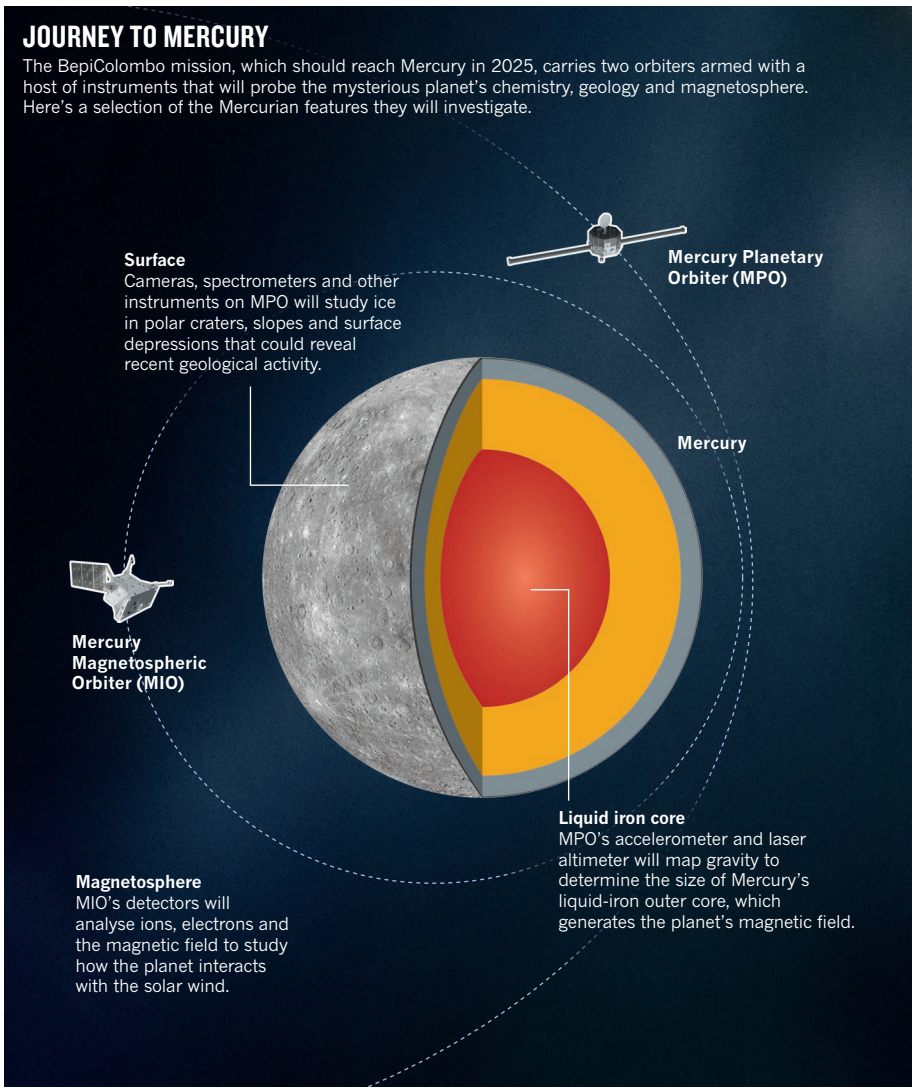
A European rocket is ready to launch the most ambitious mission ever to Mercury, Earth's once-neglected sibling in the Solar System. The €1.6-billion (US$1.85-billion) expedition, carrying 2 robotic orbiters, ranks among the most expensive missions undertaken by the European Space Agency (ESA), and includes Japan's largest contribution yet to an international collaboration in space.

If all goes according to schedule, BepiColombo will lift off in the late hours of 19 October from the Kourou spaceport in French Guiana, atop an Ariane 5 heavy-launch vehicle, to embark on a seven-year journey to Mercury. When it gets there, it will release two probes into the planet's orbit: the Mercury Planetary Orbiter (MPO), built by the European Space Agency (ESA), and the Mercury Magnetospheric Orbiter, nicknamed MIO and built by the Japan Aerospace Exploration Agency (JAXA).

The orbiters will investigate the mysteries of the innermost, smallest planet of the Solar System (see 'Journey to Mercury'). Mercury was once thought to be a static, boring place. But in recent years, it has revealed many surprises, from its unusual magnetic field to water-ice deposits in some of its craters.

BepiColombo was first conceived in the 1990s and has had a long, complicated gestation, says Johannes Benkhoff, overall project scientist and a planetary physicist at ESA in Noordwijk, the Netherlands. "It's a great moment," says Benkhoff, who has worked on BepiColombo for nearly 15 years. "Now it's becoming real."

Mercury is deep in the Sun's gravitational well, which makes reaching it a challenge. To get there, a spacecraft has to lose much of



SOURCE: ESA

the momentum it gains from Earth's orbital motion, so that it can fall towards the Sun. But it must also avoid overshooting. Because of this, it takes eight times as much energy — and a lot more time — to travel to Mercury than to Mars. BepiColombo will use advanced, solar-powered ionic thrusters combined with gravitational assists from a total of nine fly-bys of Earth, Venus and Mercury itself.

Moreover, sunlight is ten times more intense at Mercury than it is in outer space near Earth, and the planet's nearly atmosphere-free surface reaches temperatures of 400 °C. All these factors have made Mercury the least explored of the four planets of the inner Solar System: the only other probe to have entered its orbit was NASA's MESSENGER, which studied the planet from 2011 to 2015. An older NASA Probe, Mariner 10, made several fly-bys of Mercury in 1974 without entering its orbit.

The new mission is named after Giuseppe 'Bepi' Colombo, the late Italian scientist who studied Mercury and conceived of Mariner 10's gravitational-assist trajectory. MPO and MIO will each have their own science priorities. MIO will focus on the environment around Mercury — especially the magnetic field and its interaction with the solar wind. MPO will mainly scan and map the planet's surface, using instruments that can analyse most of the electromagnetic spectrum as well as neutrons that can reveal the chemical composition of the planet's crust. It will also study the gravitational field — and through that, the planet's unusually large iron core — and test some subtle predictions of Albert Einstein's general theory of relativity.

BIG OPPORTUNITIES

"The thing that's really exciting about MPO is [its] low-orbit altitude," says Nancy Chabot, a planetary scientist at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, who was a leading scientist for MESSENGER. This will enable MPO to map the entire surface at high resolution. It might even spot the 16-metre-wide crater that MESSENGER created when it dropped onto the surface at the end of its mission — potentially leaving interesting layers of rock exposed, Chabot says.

Chabot and her collaborators have found compelling evidence for the presence of ice deposits in the permanently shaded areas of some craters near the north pole. Further studies of those craters — including some that might exist at the south pole — could motivate a future mission, possibly with a lander. "Getting down to the surface is the next step," says Chabot, who is part of a working group that will try to make the scientific case for such a mission.

Meanwhile, MIO will spin continuously to get a full-sky view of Mercury's magnetosphere and the particles that wind around it, says MIO project scientist Go Murakami. "Our particle sensors can cover almost [the entire] field of view," says Murakami, a planetary scientist at JAXA's Institute of Space and Astronautical Science in Sagamihara. The intense solar wind around Mercury might be comparable to the stellar wind around planets that closely orbit relatively cool red dwarfs — the most common stars in the Milky Way. So, studying Mercury could help scientists to understand what conditions might be conducive to life on extrasolar planets, Murakami says. The BepiColombo probes are designed to last at least two years in orbit, although their mission could stretch a bit longer. But sooner or later, the heat will catch up with them, Benkhoff says. "Our time is limited. Mercury is a harsh environment." ■

CORRECTION

The News story 'Brazil's presidential election could savage its science' (*Nature* **562**, 171–172; 2018) incorrectly stated that Jair Bolsonaro had proposed eliminating the science ministry and reorganizing it under the agriculture ministry. The candidate has discussed efforts to decentralize federal science programmes in Brazil, but it's unclear how he would do so.