

The Hayabusa 2 spacecraft is about to deliver asteroid rocks to Earth

Hayabusa 2 is about to attempt an audacious feat. The Japanese spacecraft, which launched towards the asteroid Ryugu in 2014, is on its way back to Earth carrying two samples of rocks and dust from the asteroid's surface. To get these samples back to Earth, Hayabusa 2 will skim past the planet and drop its sample capsule from space on a trajectory that should land it in Australia early on 6 December local time. The sample capsule has no thrusters, so accuracy is key here.

During its time orbiting Ryugu, [Hayabusa 2](#) took many images and dropped off three rovers, but the main mission was to collect samples. The first was taken from the surface by firing a small bullet into the ground and collecting the particles that puffed up from the impact.

For the second, the spacecraft essentially [bombed the asteroid](#), blasting a piece of copper towards the surface with an explosive charge to excavate a crater about 10 metres across. This allowed Hayabusa 2 to sample pristine material from beneath Ryugu's surface.

"By looking at the surface rocks and then looking at the interior rocks, it'll really give them an understanding of how the space environment changes rocks over time," says Kerri Donaldson Hanna at the University of Central Florida.

The rocks on Ryugu are extremely porous and fragile – initial measurements suggested that they may be made up of up to half empty space. "Because they're so porous, if rocks like that had entered Earth's atmosphere as a meteor it probably would have burned up and we wouldn't have a sample of it, so these rocks are going to be really new to us and different from anything in our collection of meteorites," says Hanna.

Hayabusa 2 will drop off the [sample capsule](#) and then fire its engines again to prevent the main spacecraft from crashing down. There is still plenty of fuel, so after the samples have fallen to Earth the spacecraft will hurtle by and head off for another asteroid called 1998 KY26, which it is expected to reach in 2031.