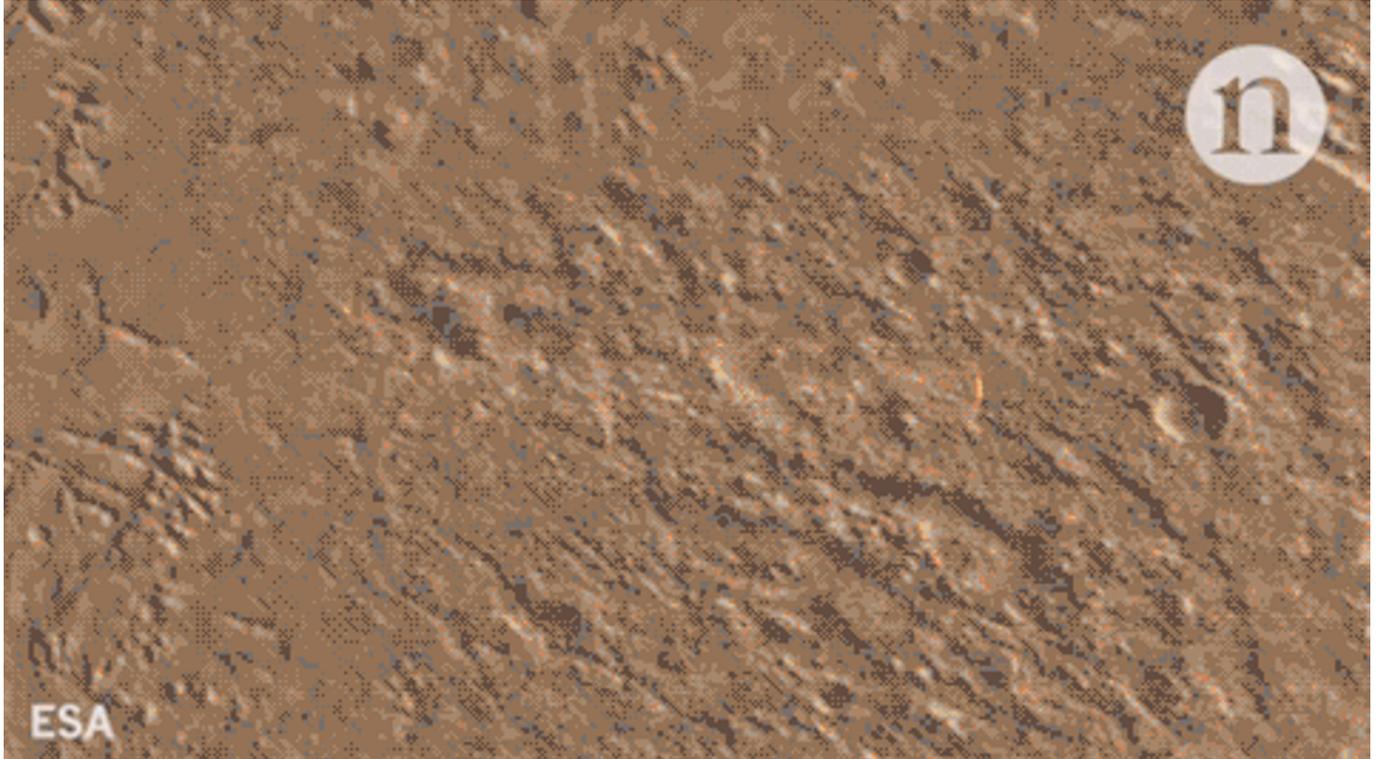


Europe and Russia prepare for historic landing on Mars

Schiaparelli touchdown would be ESA's first success on the red planet.

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ESA/Nature

An ESA visualization of Schiaparelli landing on Mars

Almost three weeks after it [crash-landed the Rosetta orbiter on a comet](#), the European Space Agency (ESA) is gearing up to land another spacecraft — this time on Mars. It hopes that a craft called Schiaparelli will touch down on the red planet on 19 October.

Compared to the pioneering Rosetta mission, landing on Mars is a more conventional feat. But for ESA, the stakes are high, given that the tally of successful landings on Mars currently stands at NASA 7, Europe 0.

Operating on the planet's surface would also be a first for Russia's space agency, Roscosmos, which is [a partner in the mission](#) — and which plans to partake in future joint Europe–Russia missions, including a 2020 rover landing on Mars. The Soviet Union came close to success in 1971 with the Mars 3 probe, which failed just 20 seconds after landing on the surface.

Given the importance of the landing, the descent through Mars's thin atmosphere will represent “our own six minutes of terror”, says Francesca Ferri, a planetary scientist at the University of Padua in Italy, referencing a line coined to describe the [landing of NASA's Curiosity rover in 2012](#). “Around 50% of the landings on Mars haven't succeeded, so it's not easy. But I'm feeling pretty confident,” says Ferri, who leads an experiment to study atmospheric data from Schiaparelli's descent.

The ESA-designed Schiaparelli lander, which is about the size of a Smart car, represents one part of the ExoMars mission that [launched from Kazakhstan in March on a Russian rocket](#). The other half is an orbiter — also designed by ESA — that will analyse gases in Mars's atmosphere, starting from December 2017.

Dusty landing

Schiaparelli separated from its mothership on 16 October. Its main job is to demonstrate landing technology, although it will also have a short science mission, studying the dust storms of the red planet for as long as its batteries last, probably between two and four days.

The lander is touching down in dust-storm season — and NASA scientists have warned that Mars could see a rare planet-wide storm this year, which would make for challenging landing conditions and hamper visibility. So far, ESA scientists say there are no signs of a major event, although that could change at any time. Schiaparelli has been designed and tested with dust storms in mind, but a strong storm could still cause problems. It would be ideal to have “nice and clear weather for the descent, but a dust storm come a day or two later”, says Håkan Svedhem, ExoMars 2016 project scientist at ESA. He says the craft should land safely whatever the weather.

The idea of landing in the middle of a dust storm thrills Francesca Esposito, the principal investigator for the lander's DREAMS instrument, which will measure characteristics of Mars's dust, as well as recording data on temperature, wind speed, humidity and pressure at the planet's surface. “A dust storm, or at least electrified dust in the atmosphere, would be great for us,” says Esposito, who works at the INAF Astronomical Observatory of Capdiomonte in Naples, Italy. A dusty atmosphere would also warm the night-time temperature on Mars, which would reduce the need for the lander to heat itself and stretch its battery life, she says.

Lightning on Mars

An antenna on the DREAMS instrument will measure Mars's electrical field for the first time, and could detect lightning, if it exists on Mars. The team hopes to learn whether electric fields trigger dust storms, whether these in turn enhance the planet's electric fields, and how the storms eventually die out. Such information could aid basic understanding of the physics of Mars's atmosphere, and could be useful for future crewed missions to the planet or for building habitats on Mars.

Schiaparelli is aiming for a smooth plain known as Meridiani Planum. NASA's Opportunity rover is situated around 15 kilometres outside Schiaparelli's 100 km × 15 km landing ellipse, and will try to get snapshots of the probe's descent, says Mark Lemmon, a planetary scientist at Texas A&M University in College Station. Although ExoMars's parachute may appear as no more than a speck, the pictures could help reveal how winds influence its trajectory, says Lemmon, adding that such shots would represent the first time a Mars landing has been seen from below.

Anyone expecting spectacular pictures from Schiaparelli itself might be disappointed — photos will be limited to 15 black-and-white shots of the Martian surface from the air, intended to help piece together the craft's trajectory. No photos will be taken on the surface, because the lander lacks a surface camera.

For now, Svedhem is just hoping for a first successful European landing. For the first three minutes after entering Mars's thin atmosphere, Schiaparelli will be slowed by drag alone before its parachute deploys to decelerate the craft more rapidly. A little over a kilometre from the surface, after 5 minutes and 22 seconds, the parachute should detach and thrusters will kick in. A 30-second burn will leave the craft a few metres off the ground and travelling at a few metres per second before it drops to the surface, where a crushable honeycomb structure on its base should cushion its landing. “I can't relax until we really know it's standing on the ground,” says Svedhem.

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