Our knowledge of the Solar System has been greatly advanced by exploration with robotic spacecraft, but there are many limitations on the instruments those can carry. More detailed information can be extracted by analyzing samples of Solar System bodies in Earth laboratories. Meteorites provide some natural samples, but the body they came from is often unknown, and they may not represent typical material. Recent years have seen increased interest in directly retrieving samples from other worlds and bringing them back to Earth, a process known as sample return.

The most primitive carbonaceous asteroids preserve information about the formation and early evolution of the Solar System and thus have been a high priority for sample return. The Hayabusa mission collected 1500 dust particles from asteroid (25143) Itokawa and returned them to Earth in 2010. A successor mission, Hayabusa2, visited asteroid (162173) Ryugu with the goal of obtaining a larger mass of sample, which is due to arrive on Earth in December 2020. Meanwhile, on 31 December 2018, the OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, and Security–Regolith Explorer) spacecraft arrived at another primitive asteroid, (101955) Bennu, with plans to return at least 60 grams of material.

Writing in *Science* and *Science Advances*, members of the OSIRIS-REx team present results from the survey and reconnaissance phases of the mission. Detailed maps of surface properties were used to identify promising sites for sample collection and provide the necessary scientific context. These data provide information on Bennu’s composition, constrain its formation process, and show how its surface evolved. They show that Bennu’s surface material has been modified by exposure to space weathering, contains abundant organic material, and has evidence of past alteration by liquid water. OSIRIS-REx successfully collected its sample of Bennu on 20 October 2020; it is due to arrive on Earth in 2023.

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The sample site on Bennu, nicknamed Nightingale. OSIRIS-REx collected material from within the blue circle.