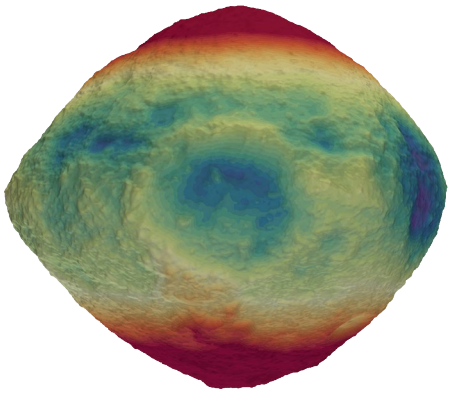
All planets great and small

Near-Earth asteroid Bennu is one of a range of bodies in the Solar System to have been reached by space missions in the past months. Crowd-sourcing technologies can help with the exploration of its surface.

Those interested in the bodies of the Solar System have had an exciting few months. Missions from space agencies around the world have successfully reached a diverse array of target bodies large and small, near and far, more familiar and newly explored. A robotic lander from NASA, InSight, touched down on Mars in late November 2018; one from the China National Space Administration, Chang'e 4, landed on the farside of the Moon in early January 2019. Two prospective sample-return missions designed in Japan and the United States, respectively, are exploring near-Earth asteroids Ryugu[1–3] and Bennu[4], and from the outer reaches of the solar system NASA's New Horizons mission is sending intriguing images of the Kuiper belt object designated (486958) 2014 MU_{69} — a doublet of joined bodies that has morphed in the public imagination from snowman to a pair of pancakes, as more imagery has become available.

In this Issue, we are pleased to present initial observations from one of these endeavours, NASA's OSIRIS-REx mission. Specifically, two papers characterize the surface geology and shape and structure of near-Earth asteroid Bennu, and an accompanying sketch-up illustrates Bennu's geological features and evolution. A broader characterization of the asteroid is revealed in a package of research papers published across the *Nature* journals.

Public engagement with planetary exploration has long been high. As early as the 1920s, space exploration was all the rage in Germany, inspiring Fritz Lang to make his silent movie *Frau im Mond* ('Woman in the Moon') — for which purportedly the count-down was invented[5]; the Cold War space race excited people's imagination on both sides of the iron curtain; and more recently, the strides in Asian exploration capabilities have created a space buzz on that continent[6]. It is no wonder then that five of the top ten *Nature Geoscience* papers by Altmetric score since January 2017 are in planetary science.



Credit: The OSIRIS-REx team, with a particular thanks to the Altimetry Working Group

With the advent of internet crowdsourcing, public interaction with space science is no longer limited to sitting and watching. The SETI@home project (https://setiathome.berkeley.edu/) has allowed those with a computer to help with the Search for Extraterrestrial Intelligence (SETI) since 1999. And a variety of space-related projects are available for volunteers to join on the Zooinverse platform (https://go.nature.com/2O3985y).

Involvement of the public can be greatly beneficial to planetary science. In a crater-counting exercise on the Moon that compared the assessments from trained experts with those of volunteers[7], experts' counts featured high uncertainties and differed substantially from each other. On the other hand, the quality of the ensemble result from groups of volunteers was found to be on a par with estimates from individual experts. Similarly, in a separate citizen science quality assessment on surface-feature identification on Mars[8], volunteers scored as highly as experts in spotting differences (although experts were better at classifying them). More importantly, though, low levels of consensus riddled experts' and volunteers' assessments alike. More pairs of eyes — trained in planetary sciences or not — appear to be an advantage when searching for features on planetary surfaces.

A plan is in place for OSIRIS-REx, too, to ask the public for help. The OSIRIS-REx team will need to decide on a location for their sample return manoeuvre by the summer. With the realization that Bennu does not have the widespread surface cover of fine-grained material that the sample-return technology was originally designed for[4], it will not be easy to determine the most promising spot — and there are vast amounts of data to look at. This is where crowd-sourcing can help: the OSIRIS-REx team is working together with CosmoQuest (https://cosmoquest.org/x/) to launch the citizen science project Bennu Mappers, by the middle of May.

Outreach is important. As more and more data come in from the various mission arrivals, our understanding of the solar system will deepen. Undoubtedly, new questions will arise, too. At *Nature Geoscience* we are keen to support the endeavour of disseminating the outcomes of those missions, to Earth and planetary scientists as well as to the public. ❐

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