

Life after NEAR

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Abstract

The NEAR mission was a spectacular rehearsal for one of the most exciting and scientifically rewarding missions of the next decade, sample return from near-Earth asteroids. A unique source of information about the early solar system, the formation of the planets, and the connection between stars and our Sun, are the meteorites and asteroids, yet studies of both are hindered by a lack of unequivocal and detailed information linking the two. Meteorites are rock samples of unknown provenance. We have no information about the geological context of their source. They are also highly non-representative sampling of primitive solar system material because the terrestrial meteorite population is dominated by the ejecta of stochastic impacts and because the atmosphere filters out all but the toughest rocks. Without sample return, asteroids are not amenable to the depth and breadth of techniques available in the laboratory, yet the NEAR images indicate that there are many processes occurring on asteroids - or that could have occurred in the past - that we must understand if the meteorite data are ever to yield a clear image of early solar system processes. Technical developments of the last few years and the discovery of large numbers of NEA mean that sample return is now within small mission capability. A team of about 20 scientists and engineers from all relevant subject fields are now assembling a mission called Hera. The primary thrust of current work is to (1) identify trajectories and targets that will yield maximum science return, (2) develop and rigorously evaluate a method for sample collection. We will present an update of these efforts at the meeting and, especially, describe recent microgravity and vacuum tests of the sample collector. We will also issue a plea for astronomical observations of the asteroids that are emerging as prime targets in our dynamic studies.