Close up, Mercury is looking less boring

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For years, many planetary scientists did not express much curiosity about Mercury, which looked gray and cratered — a slightly larger version of the Moon.

But data released on June 16 from NASA's Mercury Messenger spacecraft, which entered orbit around Mercury in March, is painting a more vibrant picture of the solar system's innermost planet.

“Mercury ain't the Moon,” Ralph L. McNutt Jr., the mission's project scientist, said at a NASA news conference on June 16.

The findings

Among the new findings: Some of Mercury's topography is not seen anywhere else in the solar system — rimless pits, for instance — and its mineralogy is vastly different from the Moon's, whose rocks have much less potassium. Scientists already knew that Mercury has a magnetic field, while the Moon does not.

The latest batch of data includes the clearest pictures yet of Mercury's polar regions, plus readings of the elements in its crust, which have helped scientists rule out some theories about the planet's origins. Mercury Messenger has also discovered that the planet's magnetic field is stronger in its northern hemisphere than in its southern, which hints at something odd in the structure of its molten core.

The new information could reveal how Mercury formed and changed over the 4.5-billion-year history of the solar system, which in turn could help astronomers understand the panoply of Earth-size planets around other stars and the possibility of conditions friendly for life on them.

NASA's Kepler telescope has discovered dozens of possible Earth-size planets, but its observations can determine little beyond their size.

“We have in our solar system four experiments in how four Earthlike planets evolve once they form under slightly different conditions,” said Sean C. Solomon, the principal investigator for Mercury Messenger, referring to Mercury, Venus, Earth and Mars, the four rocky planets of the inner solar system.

“What we're learning is that each of those experiments had an extraordinarily different outcome,” Dr. Solomon said. “And one of those experiments we live on. So it really behooves us, in a very general way, to understand how Earthlike planets form and evolve and operate.”

One of the mysteries is why the iron core of Mercury is unusually large, extending out three-quarters of the way to the surface. Earth's core, by contrast, extends a little more than halfway.

One idea was that Mercury was originally larger, and the young Sun was so intense that the radiation stripped away the outer layers, leaving behind the Mercury seen today. But that theory predicted low abundances of certain elements like potassium that would have easily evaporated in the intense heat. Mercury Messenger measured ample amounts of potassium.

“We can rule out this kind of model,” said Larry R. Nittler, a staff scientist at the Carnegie Institution of Washington and a member of the science team.

Another theory is that Mercury formed out of metal-rich meteorites. By and large, the observed composition of the surface rocks does not fit with that theory either, although a variation could still prove the correct explanation, Dr. Nittler said.

A third idea is that a giant impact early in Mercury's history knocked off a large fraction of the planet. “This is the model that is still in the running,” Dr. Nittler said. “There are probably going to be many more models devised before we have an answer on this.”

High-resolution images of craters revealed irregular pits, ranging in width from several hundred feet to a few miles. The pits do not have rims like craters produced by impacts, leading the scientists to speculate that they were etched by some unstable material that evaporated quickly when exposed at the surface.

Mercury Messenger's one-year mission around the planet is only one-quarter done, so more information about the planet will be forthcoming. Already, Dr. Solomon said, the orbiter has dispelled the misconception that Mercury is a boring place, and that what NASA's Mariner 10 spacecraft saw in 1974 and 1975 during three flybys was all that was to be seen.

“Some even in the planetary community, after the Mariner 10 mission, placed a low priority on returning a spacecraft to Mercury on the grounds that it was very much like the Moon, we'd been to the Moon,” Dr. Solomon said. “It was an example, to use a phrase coined by a very famous space scientist, of ‘one of the burnt-out cinders of the solar system.' And it is anything but that.”

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