Title: Getting the message
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Source: *Current Science, a Weekly Reader publication*. 97.12 (Mar. 30, 2012): p6.
Document Type: Article
Full Text:

"I was nervous," says Nancy Chabot Late last March, she and a group of fellow planetary scientists had crowded around computer screens at the Applied Physics Laboratory at Johns Hopkins University. The scientists had spent many months preparing for the moment. Would everything go as planned? Finally, an image popped onto the screens: the barren, cratered surface of the planet Mercury. "It was beautiful!" says Chabot.

That image was the very first sent by MESSENGER, the first spacecraft to orbit Mercury. Since then, MESSENGER (short for MErcury Surface, Space ENvironment, Geochemistry, and Ranging) has transmitted thousands more photos and a flood of data back to Earth. The more scientists learn about the little planet, the stranger it seems.

THE INNER PLANET

Mercury is the smallest planet and the closest one to the sun. It's also located relatively close to Earth--77 million kilometers (48 million miles) away when the two planets are nearest to each other.

Still, getting to Mercury wasn't simple. The voyage took six and a half years and involved 7.9 billion kilometers (4.9 billion miles) of travel and 15 trips around the sun. The long, complex trip positioned MESSENGER at the right time, place, and speed for Mercury's gravity to capture it. Finally, on March 18,2011, everything was in place to put the spacecraft into Mercury orbit. For mission scientist David Blewett of Johns Hopkins University, that day was the tensest of the whole mission. "The main engine had to fire for exactly the correct amount of time, in the right direction, and with the right amount of force," he told Current Science. When MESSENGER settled into orbit, cheers and applause rocked the auditorium where the scientists had gathered.

Now MESSENGER, which is about the size of an SUV, orbits Mercury once every 12 hours. Its sunshade and graphite construction help it withstand the heat emanating from the sun and bouncing back from Mercury. On the planet's sunny side, temperatures soar to 425 degrees Celsius (800 degrees Fahrenheit). On its dark side, they plunge to-185 degrees C (-300 degrees F).

MESSENGER'S orbit is highly elliptical (oval). At its nearest point, the spacecraft is 200 kilometers (124 miles) from the planet; at its farthest point, it's 15,000 kilometers (9,320 miles) away. That route gives the spacecraft a break from the extreme heat near the planet. Seven onboard instruments transmit photos as well as data about chemistry, temperature, and other features from both sides of the planet.

STRANGE PITS

Mercury was once regarded as an odd charred crumb of a planet "Now we are realizing that it's even stranger," says Blewett

One discovery has caused scientists to jettison old theories about Mercury's evolution. Scientists have long known that Mercury has a relatively large core. They know that because the planet has a high density and an outer layer composed of relatively light rock. Only a large iron core could account for the planet's hefty weight

To explain the formation of Mercury's large core, scientists have hypothesized that much of the planet's outer shell was either (1) blasted away by excessive heat from violent explosions on the sun or (2) stripped away by a mega-collision with a similar-sized object. Such violent beginnings would have left hardly anything behind but the core.

However, new chemical data from MESSENGER blows a hole in those hypotheses. The spacecraft's instruments have detected abundant sulfur on Mercury's surface. Sulfur is a volatile element. It would have vaporized and

escaped into space if a superheated sun or an impact had played a role in shaping the planet. "We are back to the drawing boards on how the innermost planet in our solar system was assembled and evolved," says Sean Solomon. Solomon is a geophysicist with the Carnegie Institution of Washington and the principal investigator of the MESSENGER mission.

Another finding is even more bizarre. Photos show strange pits--hollows, they're called--riddling the floors of some of Mercury's craters. Nothing like them has ever been seen anywhere else in the solar system. Are the hollows collapsed pits from gases escaping from inside the planet? Were they scoured by fierce solar winds? Are they still forming? No one knows.

FAR-FLUNG LESSONS

As different as Mercury is from Earth, MESSENGER has detected some unexpected similarities, such as an abundance of potassium and a lot of volcanic activity in its past. The MESSENGER scientists hope that by exploring Mercury, they will learn more about the processes that created Earth and the other rocky planets (Venus and Mars).

MESSENGER could also shed light on hundreds of other planets. Like Mercury, many exoplanets (planets that orbit other stars) are situated very close to their stars. "Mercury is our nearest laboratory for studying planet formation near a sunlike star," says Solomon.

MESSENGER is scheduled to orbit Mercury until at least March 2013. Meanwhile, the mission's photos and discoveries are sure to keep thrilling the scientific world. "Personally, I still get really excited about seeing part of the planet that has never been imaged by spacecraft," says Chabot.

"Scientists will be using data from MESSENGER for many years to come," says Blewett.

NASA'S MESSENGER SPACE PROBE HAS SHOWN MERCURY TO BE STRANGER THAN ANYONE THOUGHT.

MESSENGER has found strange pits (colored in blue), called hollows, at the bottom of several craters on Mercury.

This MESSENGER view of a northern region of Mercury shows several ghost craters--impact craters buried under volcanic lava. One outpouring of lava that happened 3.5 biliion years ago was epic. It filled craters that were more than a mile deep and covered 6 percent of Mercury's surface--an area equal to almost 60 percent of the continental United States.

MESSENGER has detected bright deposits in craters near Mercury's north pole. The deposits may be water ice. Ice could exist on Mercury in cold, shadowy depths that are never exposed to sunlight.

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Source Citation
Geiger, Beth. "Getting the message." *Current Science, a Weekly Reader publication* 30 Mar. 2012: 6+. *Educators Reference Complete*. Web. 3 Aug. 2012.

Document URL
http://go.galegroup.com/ps/i.do?id=GALE%7CA284483409&v=2.1&u=4104mtnla&it=r&p=PROF&sw=w

Gale Document Number: GALE|A284483409

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