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## NEW GROUND-BASED PHOTOS OF MERCURY'S UNSEEN SURFACE OBTAINED BY BOSTON UNIVERSITY ASTRONOMERS

(Boston, Mass.) — Ever since Galileo first used a telescope in 1609, astronomers have tried to capture images of the surface of Mercury with a ground-based telescope. Now, a team of astronomers from Boston University released images revealing details of Mercury's surface in the May issue of *The Astronomical Journal* and at the American Geophysical Union in Washington, DC.

“More than a quarter-century ago, the Mariner 10 spacecraft flew past Mercury and for the first and only time transmitted satellite-based photos of half of the surface of the planet closest to the Sun,” says lead author Jeffrey Baumgardner, senior research associate in the Center for Space Physics at BU. “Capturing similar images from a ground-based telescope represents a significant milestone in advanced instrumentation,” he adds.

The BU images, taken on August 29, 1998, at the Mt. Wilson Observatory in California, reveal surface markings similar to the bright craters and dark lunar mare found on the Moon. The BU images captured using a digital camera and stored on CD-ROMs for subsequent processing show never-before-seen portions of Mercury.

Photographing Mercury is challenging because of the planet's proximity to the Sun. Mercury only has a few viewing times, before sunrise or shortly after sunset. At rare times when 'the seeing' is right, the air is clear and researchers are looking through less turbulence in Earth's atmosphere. Opportunities to photograph Mercury from space are also limited because light sensitive equipment, such as the Hubble Space Telescope, are not allowed to look at objects close to the Sun, such as Mercury or Venus. This restriction has been established to avoid the possibility of an accidental pointing error causing too much light to fall upon an instrument.

“The observations were made shortly after sunrise before the Sun's heating of the atmosphere distorted the images captured by the telescope,” says Michael Mendillo, professor of astronomy at BU.

In order to obtain a clear photograph Baumgardner took images with very short exposures, 1/60<sup>th</sup> of a second, continuously for 90 minutes. “That comes to 340,000 pictures,” Mendillo added. “The trick to getting a clear image was then to find the best

ones, say 30 to 60, that could be added together by computer to create a time exposure of sufficient duration (.5 to 1 second) in order to capture detail on Mercury's surface.”

Baumgardner and Research Associate Jody Wilson assisted by Mead Misic, a sophomore in the College of Engineering, all took part in the search for the perfect images. They developed sophisticated computer techniques to identify the best images with detail taken during rare instances of 'perfect seeing.'

“We captured multiple images of Mercury during these rare instances of 'perfect seeing,’” says Wilson. “and by combining these images, a unique photograph with details and clarity resulted. ”

The Boston University team plans to make additional observations of Mercury this fall, even pushing the technique to try to image the planet's weak atmosphere. “Mercury has a thin atmosphere created by the ejection of atoms from its surface, a process that also occurs on our Moon,” Mendillo explained. One of the chemical elements in Mercury's atmosphere is sodium, a gas somewhat easy to detect because it reflects sunlight very efficiently. “We hope to try our first sodium detection experiments this fall,” Baumgardner said. “But that will first involve building a more sensitive detector system.”

For more information, log on to  
[http://www.bu.edu/csp/imaging\\_science/planetary/mercury/](http://www.bu.edu/csp/imaging_science/planetary/mercury/)

Photos:

1. Figure (with caption)

(Top) This image of a portion of Mercury's surface not photographed by Mariner 10 in 1974-75 was obtained by Boston University astronomers using observations made at the Mt. Wilson Observatory in August 1998. Hundreds of thousands of pictures taken with short time exposures (1/60<sup>th</sup>) were examined to find the 30 images with the clearest surface markings, taken during instances of "perfect seeing" through the Earth's atmosphere.

(Bottom) A Mercator-projection map of the high definition image of Mercury taken by BU astronomers on 29 August 1998 shown in comparison to the side of the planet photographed from close range by NASA's Mariner 10 spacecraft in 1974-75.

Photo credit: Baumgardner et al., Boston University

