onstrated this technique in the laboratory with a test sample consisting of scattered nanocrystals of a fluorescent compound, pyridine. With a burst of an ultraviolet laser, they sparked fluorescence in the crystals. They then sent in the second laser pulse, known as the stimulated emission depletion (STED) pulse, to take a bite out of the first one. The result was dramatic: Where two pyridine molecules appeared as a single blur without the STED beam, they could be distinctly resolved once the STED beam was turned on.

Gu says he is impressed by the 30% improvement in resolution, which allowed the STED microscope to distinguish crystals as little as 100 nm apart. Peter So, a mechanical engineer at the Massachusetts Institute of Technology in Cambridge, thinks the resolution could eventually reach 30 nm, fine enough to distinguish structure in individual DNA molecules. Advances like Hell's are a sign, So believes, "that we are in the midst of a renaissance in optical microscopy."

–MEHER ANTIA

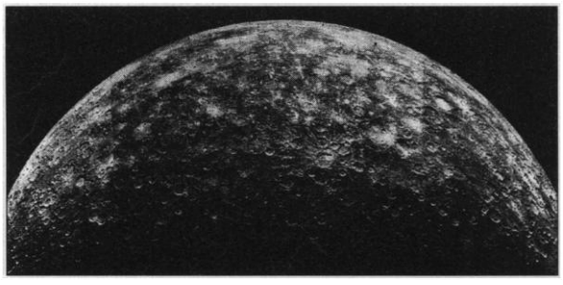
Meher Antia is a writer in Vancouver.

SPACE SCIENCE

NASA Plans Close-Ups Of Mercury and a Comet

NASA last week selected two spectacular shows as part of its Discovery program of quick and cheap space missions. In 2008 and 2009, a spacecraft will scrutinize Mercury, and in 2005, another mission will shoot a massive copper cannonball into a comet to learn more about its innards. The scheduled date for the cometary fireworks, which space enthusiasts can watch from Earth: 4 July.

The spacecraft Messenger, to be launched in spring 2004, will orbit Mercury for 1 year after two brief flybys. Loaded with cameras to map the planet's surface and spectrometers to analyze its crust and tenuous atmosphere, Messenger will transmit the first close-ups of Mercury since the Mariner 10 mission in 1974–75. Messenger should shed light on how planets form and why some, like Mercury and Earth, have retained their magnetic fields while others, like Mars, have shed theirs, says planetary scientist Sean Solomon of the Carnegie Institution of Washington's Department of Terrestrial Magnetism, who leads the $286 million mission.

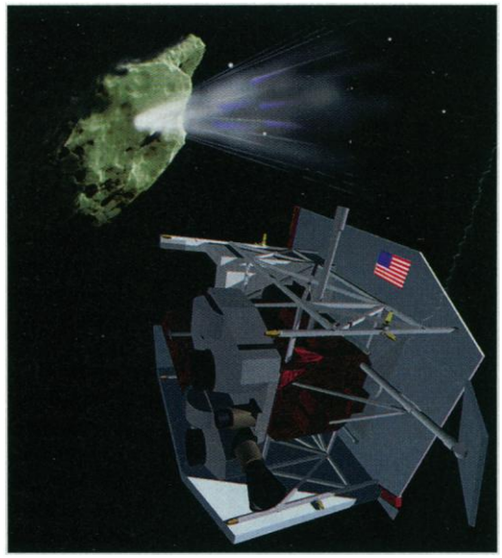


Pockmarked planet. Messenger will take the first close-ups of Mercury since 1975.

The extremely dense planet consists mainly of a large metal core, says planetary geophysicist Raymond Jeanloz of the University of California, Berkeley. A giant impact, much like the one that chipped off Earth's moon, may have splashed off most of Mercury's mantle, he says. Messenger's gravity mapping studies will probe for evidence of crust-busting impact sites. The mission should also reveal whether volcanoes have shaped Mercury's surface and if ice exists in the shadows of its polar craters, says planetary scientist Faith Vilas of the Johnson Space Center in Houston.

In January 2004, a $240 million mission called "Deep Impact" will take off for comet Tempel 1, which circles the solar system every 5.5 years. When it arrives a year and a half later, an observation module will release an "impactor"—essentially a 500-kilogram copper bullet—which will slam into the comet's surface at a speed of 10 kilometers per second. A camera onboard the bullet will transmit images as it hurtles toward its target; the hovering observer module will record both the crash and the size and shape of the resulting crater, and analyze solid and gaseous material released by the blast.

The crash may help answer questions about the composition of comets and their chemical histories, says Lucy McFadden of the University of Maryland, College Park, one of the project's scientists. Comets formed from primordial material condensing at the edge of the solar system, but their interiors may have heated and undergone chemical changes during their tours through the solar system. So far, scientists have only been able to model these processes and simulate comets' internal properties. "This is an in situ experiment that will constrain these theories," says McFadden. Indeed, Deep Impact marks planetary science's graduation from classic, observational studies to active experimentation, notes Alan Stern of the Southwest Research Institute's Department of Space Studies in Boulder, Colorado.



Smash hit. Deep Impact will fire a copper cannonball into comet Tempel 1.

The approval of Deep Impact follows close on the heels of a NASA decision to scrap a mission, called Champollion, that would have attempted a soft landing on Tempel 1. The lander would have drilled into the comet's surface and analyzed core samples at different depths. Although its estimated cost was roughly the same as that of Deep Impact, Champollion fell within NASA's New Millennium Program and was competing for scarcer funds than the Discovery Program missions.

Deep Impact should entertain the Earthbound as well as further space science: If skies are clear, the celestial collision will be visible with a pair of ordinary binoculars. But don't expect too much: The comet will look like a small smudge, and the impact will show up as a mere pinpoint of bright light.

–LAURA HELMUTH

YOUNG FACULTY AWARDS

Keck Helps Five Careers With $1 Million Grants

All spring Yale University biophysicist Mark Gerstein had been on tenterhooks. As one of 10 finalists in the W. M. Keck Foundation's new Distinguished Young Scholars in Medical Research program, Gerstein was on the verge of getting a flexible, $1 million grant—a significant bounty for a researcher of his age (33). But after making his pitch in April, Gerstein's phone went silent—until last week, when he learned that he was one of five junior faculty members in the United States to make the final cut. "I was ecstatic," he says. "But I'm also relieved—that's a lot of grant applications that I won't have to write for a few years." Gerstein's $1 million award will support his research in genomics and bioinformatics.

The Los Angeles–based foundation,

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