Lab discoveries find

Earth’s wet moon, an icy Mars

Data from three spacecraft confirm water molecules on lunar surface

Three JPL instruments have played a central role in the discovery of water molecules in the polar regions of the moon—a possibility long imagined by scientists that could help provide resources for future humans living on Earth’s natural satellite.

The JPL-managed Moon Mineralogy Mapper, or M3, instrument reported the observations. M3 was launched Oct. 22, 2008, aboard the Indian Space Research Organization’s Chandrayaan-1 spacecraft. Data from the Visual and Infrared Mapping Spectrometer on JPL’s Cassini spacecraft and the High-Resolution Infrared Imaging Spectrometer on the JPL-managed Epoxi spacecraft contributed to confirmation of the finding. The imaging spectrometers revealed water molecules in amounts that are greater than predicted, but still relatively small. Hydroxyl, a molecule consisting of one oxygen atom and one hydrogen atom, also was found in the lunar soil.

“This is an exciting discovery on the 40th anniversary of the Apollo 11 landing that provides the impetus for new ideas and opportunities, for which JPL is in a strong position to compete,” noted Cinzia Zuffada, JPL associate chief scientist. “It is likely to change our understanding of the moon. This exceptional accomplishment rests on the state-of-the-art M3 spectrometer developed at JPL and is a tribute to the Laboratory’s commitment to the success of such a complex international collaboration.”

“These intriguing results,” added JPL Planetary Science Instruments Manager Chris Webster, “remind us of the great richness in science discovery that accompanies every planetary mission that we conduct; even to our nearest neighbor that we thought was well understood.”

M3’s spectrometer measured light reflecting off the moon’s surface at infrared wavelengths, splitting the spectral colors into small enough bits to reveal a new level of detail in surface composition. When the mission’s science team analyzed data from the instrument, they found the wavelengths of light being absorbed were consistent with the absorption patterns for water molecules and hydroxyl.

JPL’s Rob Green, project instrument scientist for M3, noted that the instrument—which weighs about 20 pounds, runs with the energy equivalent to a 20-

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Reconnaissance orbiter sees frozen water exposed by meteor impacts

In a fortuitous and unexpected discovery, JPL’s Mars Reconnaissance Orbiter has revealed frozen water hiding just below the surface of the Red Planet’s middle latitudes. The spacecraft’s observations were obtained after meteorites excavated fresh craters.

The findings provide “a new window into the ‘water on Mars’ story,” noted Suzanne Smrekar, Mars Reconnaissance Orbiter deputy project scientist. “The distribution of subsurface ice is something scientists have been pursuing for a long time. This is our first insight into how water and climate have changed on Mars over the last 10,000 to 100,000 years.”

Scientists controlling instruments on the orbiter found bright ice exposed at five Martian sites with new craters that range in depth from about half a meter to 2.5 meters (1.5 feet to 8 feet). The craters did not exist in earlier images of the same sites. Some of the craters show a thin layer of bright ice atop darker underlying material. The bright patches darkened in the weeks following initial observations, as the freshly exposed ice vaporized into the thin Martian atmosphere. One of the new craters had a bright patch of material large enough for the orbiter’s spectrometer to confirm it is water-ice.

The findings indicate water-ice occurs beneath Mars’ surface halfway between the north pole and the equator, a lower latitude than expected in the Martian climate.

“This ice is a relic of a more humid climate from perhaps just several thousand years ago,” said Shane Byrne of the University of Arizona, a member of the team operating the orbiter’s High Resolution Imaging Science Experiment, or HiRISE camera, which captured the images. Byrne and 17 co-authors report the findings in the Sept. 25 edition of the journal Science.

“We now know we can use new impact sites as probes to look for ice in the shallow subsurface,” said Megan Kennedy of Malin Space Science Systems, a co-author of the paper and member of the team operating the orbiter’s Context Camera.

During a typical week, the camera returns more than 200 images of Mars that cover a total area greater than California. The camera team examines each image, sometimes finding dark spots that fresh, small craters make in terrain covered with dust. Checking earlier photos of the same areas can confirm a feature is new. The team has found more than 100 fresh impact sites, mostly closer to the equator than the ones that revealed ice.

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Planning calls for the building to house project team members who are transitioning from mission formulation phase to development and implementation. In late September, is so much more than a structure that will order, the Soil Moisture Active and Passive Mission, October. System Exploration and Mars Exploration director- formulation phase to development and implementa- team members who are transitioning from missions’

Building a future for flight projects

By Mark Whitson and Alex Abele

JPLs sparking new Flight Projects Center, which started in

The six-story building will be completely occupied

Auditorium,” added Marian Inova, manager of JPL’s

to study such a fresh impact site prompted a look by the

The next groups to move in, said Jones, will be, in

All told, more than 40 meeting/conference rooms

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JPL mission while it was flying past the moon in June

One of the great ironies of the discovery, Smrekar

smirkeh provided full-service networking capabilities

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wall light bulb and is about the size of a desktop laser printer—has returned almost 1,000 gigabytes of data in

The building will be completely occupied by JPL projects through NASA’s Construction of

North of all those who thought the moon was just a

Earth’s moon (Continued from page 1)

Continental Page 1 (Continued)

infinite in number. It represents the first in a progression of rovers that

For large meetings that don’t quite require all the

Jane Feakes showed off the new building. Also, the structure well exceeds standards

The 185.4-square-foot Flight Projects Center is the

Other meetings will be available, Inova said. To

the vicinities of 1976’s Viking 2 lander, which had an arm that

A green, living roof atop the new 422-seat auditori-

of the results and some of the highlights from the early

Work has already begun to study such a fresh impact site prompted a look by the

65 percent of construction waste has been recycled.

Building a future for flight projects

By Mark Whitson and Alex Abele

Overall, the facility’s efficiency measures include enhanced wall and roof insulation and windows going all

The team found ice,” she said. In a similar find to Cassini’s

The team included data from a 1999 Cassini flyby of the moon, but the findings were not published until now. “The

did represent the first in a progression of rovers that

The building will be completely occupied by early December. Jones said: Maximum occupancy is 620 in offices and workstations, with about 100 people per floor.

The 185.4-square-foot Flight Projects Center is the

The facility also includes some new recycling features not found in other buildings on Lab.

An exercise room is also being prepared in the

A noticeable improvement, Inova noted, is that we build robust but sophisticated spectrometers

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An image from the camera on Aug. 10, 2008, showed

Preparing the building for the upcoming
deriver, Pete Jones shows off the new building. Also, the structure well exceeds standards

JPL’s groundbreaking mars exploration station, which was

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Inova noted. “So the build-up has been more

The green, living roof atop the new 422-seat auditori-

The soil moisture active and passive mission, October. System exploration and Mars exploration director-

For additional confirmation, scientists turned to the

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The state-of-the-art auditorium contributes signifi-

dozen of seawater. While Wallace noted, Wallace

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**Doody releases book**

Dave Doody, flight operations lead engineer for the Cassini Mission Support and Services Office, has authored a new book, "Deep Space Craft: An Overview of Interplanetary Flight."

Written for advanced undergraduates of astrophysical engineering/mission design as well as broader professionals and researchers, the book offers an insider's view of current and recent interplanetary space exploration and spacecraft that operate throughout the solar system. Also discussed are space-related fields of specialization, experiments and instrumentation, and the interaction between science teams and flight teams to plan and specify observations, gather and analyze data in flight, and present results and discoveries to the scientific community.


**Community Enrichment Program**

The Aviation Educator of the Year Award, sponsored by the California Association of Aeronautics Educators, and NASA's Lifetime Achievement Award from the Aerospace Education Services Program.

She is survived by her sister-in-law Julie and many nieces, nephews and cousins. Services were held in Fremont, Calif.

**Martin Berdahl**

91, a retired engineer and manager, died Aug. 22.

Berdahl started at the Caltech wind tunnel in 1951 as an instrumentation engineer. When the wind tunnel was shut down, he moved to JPL's Instrumentation Section in 1961 as a group supervisor, then to section manager in 1963. He accepted an assignment in India for two years to help develop India's equivalent to the U.S. National Bureau of Standards, then returned to JPL. He was a leader in the Instrumentation Section to continue his technical developments. He was interested in his own family. He was a good father and a good volunteer. His wife, Barbara, daughter Susan, son John, and many grandchildren and great grandchildren. Services were held Sept. 23 at Douglas and Zook Mortuary in Monrovia.

**Fighting seasonal, H1N1 flu**

**By Dr. Robert Estrada**

JPL Occupational Health Services

The seasonal flu is a serious, contagious disease. Each year in the United States, on average, more than 200,000 people are hospitalized and 36,000 people die from seasonal flu complications.

This flu season could be the worst ever. A new and very different influenza virus called 2009 H1N1 is circulating now. The Centers for Disease Control expects 2009 H1N1 flu and seasonal flu to cause illness, hospital stays and deaths this season and is preparing for an early and possibly severe flu season.

The Centers for Disease Control urges you to take three actions to protect against the flu:

1) Take time to get a flu vaccine. The Centers for Disease Control recommends a yearly seasonal flu vaccine as the first and most important step in protection against seasonal influenza. Although there are many different flu viruses, the seasonal flu vaccine protects against three seasonal viruses that research suggests will be the most common in a given year. Such vaccination is especially important for people at high risk of serious flu complications including young children, pregnant women, people with chronic health conditions like asthma, diabetes or heart and lung disease, and people 65 years and older. Seasonal flu vaccine also is important for health-care workers and for people who live with or care for high-risk people to keep from getting them sick. However, a seasonal vaccine will not protect you against 2009 H1N1.

2) Take every precaution. Cover your nose and mouth with a tissue when you cough or sneeze. Throw the tissue in the trash after you use it. Wash your hands right after and often with soap and water. If soap and water are not available, use an alcohol-based hand sanitizer rub. Avoid touching your eyes, nose and mouth. Germs spread this way. Try to avoid close contact with sick people. If you are sick with a flu-like illness, stay home and don't go out except to get medical care or for other necessities. Fever is a good indicator of how ill you are. Don't return to work until the fever is gone for at least 24 hours without the use of a fever-reducing medicine. While sick, limit contact with others as much as possible to keep from infecting them. Follow public health advice regarding school closures, avoiding crowds and other measures to keep your distance from others to lessen the spread of flu.

3) Take flu antiviral drugs if your doctor recommends them to you. If you get the seasonal or 2009 H1N1 flu and your doctor says the flu antiviral drugs can treat the flu, antiviral drugs are prescription medicines (pills, liquid, or an inhaled powder) that fight the flu by inhibiting flu viruses from reproducing in your body. The priority use for antiviral drugs this season is to treat people who are very sick (hospitalized) or people who are sick with flu-like symptoms and who are at increased risk of serious flu complications, such as pregnant women, very young children, people 65 and older and anyone with certain chronic health conditions. However, most people have been able to recover from home at home from 2009 H1N1 or seasonal flu without needing medical care or antiviral medication.

Neither flu nor antiviral drugs recommended by your doctor can make illness milder and shorten the time you are sick. They may also prevent serious flu complications. Such antiviral drugs are not sold over-the-counter and are different from antibiotics normally used for bacterial infections. For treatment, such antiviral drugs work best if started within the first two days of symptoms.

For updated information and to find out what to do if you get sick with the seasonal flu or 2009 H1N1 flu and how to care for someone at home who is sick with the flu, visit the Centers for Disease Control H1N1 website at [http://www.cdc.gov/h1n1/](http://www.cdc.gov/h1n1/).

To learn more about the two influen- zas, visit the new JPL Occupational Health Services Influenza, Seasonal & H1N1 page at the Occupational Health Services website, [http://hr.jpl.nasa.gov/ods](http://hr.jpl.nasa.gov/ods).

To find out where you can get a seasonal flu shot in your area, visit the American Lung Association's Flu Clinic Locator at [http://www.lungusa.org/site/pp.asp?w=cqkGL0MBH6&d=1015603](http://www.lungusa.org/site/pp.asp?w=cqkGL0MBH6&d=1015603).