Discovery Dispatch

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Discovery Welcomes Andy Dantzler

Andy Dantzler has been named the Deputy Director of the Solar System Exploration Division at NASA Headquarters. As Deputy to Orlando Figueroa, one of his responsibilities is Director of the Discovery and New Frontiers Programs. He will be working closely with the Discovery/New Frontiers Program Office that was established at JPL in January.

Andy comes to this position from Goddard Space Flight Center in Greenbelt, MD, where he was the Assistant Director of Space Sciences for Technology since 2001. Previously he served as Assistant Chief of the Laboratory for High Energy Astrophysics and Instrument Manger for both the Landsat and Earth Observing Projects. He began his career at NASA as an optical engineer after earning a B.S. degree in astronomy from the University of Maryland.

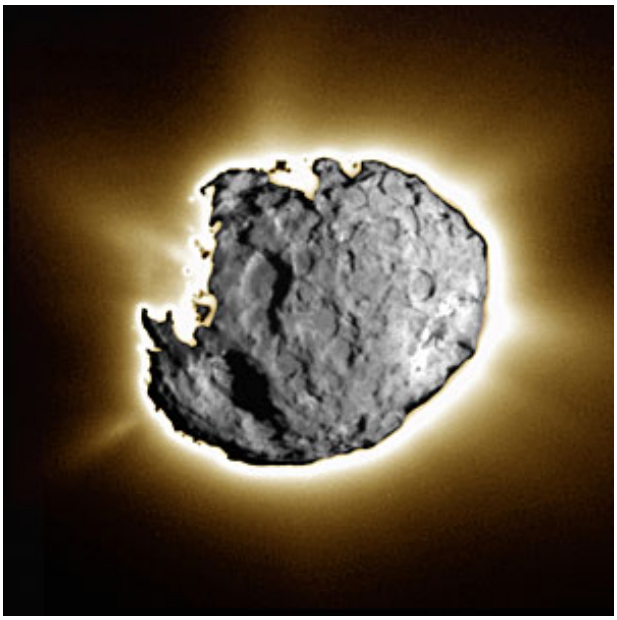
Note from Andy Dantzler

This is a great time for all who are involved in Solar System Exploration. So much is happening, seemingly all at once. Particularly those involved in the Discovery Program will have their plates full over the next several months. With the planned launches of MESSENGER in August and Deep Impact in December, the retrieval of Genesis in September, and the submission and evaluation of new Discovery proposals this summer and fall, this Program will see a torrent of activity in all phases of development. And, of course, the fun continues into the following years.

Discovery is a truly exciting program, with world class, highly visible science. A significant part of my job will be to ensure that this Program remains healthy, with frequently launched, low-cost, successful missions. I look forward to working towards this goal with John McNamee, his staff, and all of the folks involved in Discovery.

Stardust Cruises Home as Images are Studied

On January 2, 2004, the Stardust spacecraft survived flying through the hazardous dust and gas cloud, or coma, surrounding comet Wild 2 and successfully captured thousands of fresh cometary dust particles that were released from the comet's surface just hours before. Stardust is now on its way back to Earth, where the sample return capsule will parachute into the U.S. Air Force Utah Test and Training range in January 2006.



This composite image was taken by the navigation camera during the close approach phase of Stardust's Jan 2, 2004 flyby of comet Wild 2. Several large de-pressed regions can be seen. Comet Wild 2 is about five kilometers (3.1 miles) in diameter. To create this image, a short exposure image showing tremendous surface detail was overlain on a long exposure image taken just 10 seconds later showing jets.

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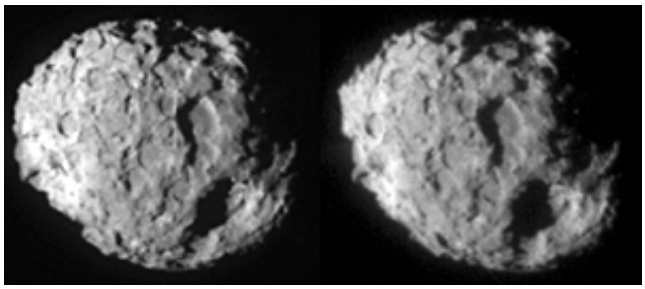
http://discovery.nasa.gov

During the flyby, the highest resolution images ever taken of a comet's nucleus were obtained and have since been the subject of intense study. "This spectacular composite image (see page 1) shows a surface feature unlike any other planetary surface seen to date in our solar system", said Prof. Don Brownlee, the Stardust Principal Investigator from the University of Washington. "Other than our Sun, this is currently the most active planetary surface in our solar system, jetting dust and gas streams into space and leaving a trail millions of kilometers long."

A second image, shown below as a stereo pair, prompted Project Manager Tom Duxbury from JPL to observe, "The overall shape of the nucleus resembles a thick hamburger patty with a few bites taken out. The surface has significant relief on top of this overall shape that reflects billions of years of resurfacing from crater impacts and out gassing".

Preliminary scientific results obtained from the Wild 2 encounter were presented in March at the Lunar and Planetary Science Conference by the Stardust science team.

In February, Deep Space Maneuver #4 was successfully performed, utilizing the same mode that will be used for Earth return. During the burn, all solar array segments were verified to be working properly, indicating that no damage occurred while inside the coma of comet Wild 2.



Stereo image pair of comet Wild 2

Education and Public Outreach Highlights

The Stardust project was presented an award from the Boy Scouts of America San Gabriel Valley Council for the successful Wild 2 encounter and to commemorate the Council's highlighting of Stardust during the National Jamboree. The ceremony was held during a talk by Project Manager Tom Duxbury as part of JPL's von Karman Lecture Series.

Genesis Samples Stowed for Return to Earth

The Genesis spacecraft has been collecting pristine particles of solar wind since November 2001 on specially designed collector arrays. The collection period came to an end on April 1, when the Genesis team turned off the solar wind concentrator, stowed the collector arrays, and closed the science canister cover, locking it tight. The following day they closed the sample return capsule backshell and latched it in the configuration necessary for entry through Earth's atmosphere.

"This is a momentous step," said Genesis Project Manager Don Sweetnam. "We have concluded the solar wind collection phase of the mission. Now we are focusing on returning to Earth, this September, NASA's first samples from space since Apollo 17 back in December 1972.

The Genesis team met at the Utah Test and Training Range approximately one year before the scheduled capsule arrival and placed a plaque on the desert floor in anticipation of a successful return.

The Genesis mission was launched in August 2001 from the Cape Canaveral Air Force Station, FL. Four months and about one million miles later, the spacecraft began to amass solar wind particles on hexagonal wafer-shaped collectors made of pure silicon, gold, sapphire and diamond.

"The material our collector arrays are made of may sound exotic, but what is really unique about Genesis is what we collected on them," said Principal Investigator Don Burnett of Caltech. "With Genesis we've had almost 27 months far beyond the Moon's orbit collecting atoms from the Sun. With data from this mission, we should be able to say what the sun is composed of at a level of precision for planetary science purposes that has never been seen before."

In late April, Genesis will execute the first in a series of trajectory maneuvers that will place the spacecraft on a route toward Earth. On May 2, 2004, Genesis will conduct an Earth flyby as it follows the planned trajectory back home. On Sept. 8, 2004, the sample return

capsule will re-enter Earth's atmosphere for a planned landing under parachute at the U.S. Air Force Utah Test and Training Range at about 9:15 a.m. EDT.

To assure the particles and their delicate collector arrays land safely, specially trained helicopter pilots will snag the return capsule from mid-air using giant hooks. The flight crews for the two helicopters assigned for the capture and return of Genesis are former military aviators, Hollywood stunt pilots and an active-duty Air Force test pilot.

Education and Public Outreach Highlights
The Genesis E/PO team is preparing for return this September with several new products developed to assist in engaging the public and educational communities in the excitement of NASA's first sample return mission since Apollo. Those products include a book cover highlighting the mid-air capture, sample return fact sheet, and new mission animation highlighting the entry-descent-landing sequence and capture by the helicopter. The animations will be distributed in June to the JPL Museum Visualization Alliance and the International Planetarium Society.

The Clark Planetarium in Salt Lake City is planning to host many Genesis-related events in early September, including an educator workshop for Utah science teachers and a science night focused on Genesis with live presentations, videos, kiosk demonstrations, displays, and models.

The Genesis project has released its newest education module for students and teachers. "Data Analysis and Generalizations" is an advanced high school or post-secondary module that engages students in studying real solar wind information collected from the Genesis spacecraft and posted on the Los Alamos National Laboratory Genesis Science Data web site. Although the module is designed to be an open-inquiry investigation, teachers are provided with suggestions for guiding students who want or need assistance in designing and conducting the investigation.

MESSENGER Launch Rescheduled

The planned May launch of the MESSENGER spacecraft - the first designed to orbit the planet Mercury - has been rescheduled for no earlier than 30 July. A number of events led to this decision.

MESSENGER's Pre-Ship Review was held on March 2. The review board recommended that the spacecraft proceed to the Cape for launch operations. At the same time, the board raised concerns about the state of readiness of fault protection verification and mission operations. A full-day Fault Protection Review was held on 4 March. The Fault Protection Review board found deficiencies in the fault protection test plan scope and implementation, and they expressed doubt that there was sufficient time before the Mission Readiness Review scheduled for April 15 to thoroughly test fault protection.

Although the MESSENGER spacecraft was shipped to the Cape on March 9-10, the decision was made to delay the launch until the July/August time period to allow additional test time for addressing the issues identified by the review boards. An additional factor leading to the delay decision involved potential launch pad conflicts with planned Air Force launches and scheduled pad maintenance. The July/August launch period provides maximum flexibility in addressing the competition for launch pad resources.

At the Astrotech Space Operations facilities near KSC, workers rotate the MESSENGER spacecraft on the turnover fixture to perform the propulsion system phasing test - firing gas through the thrusters to verify that the right thrusters fire when expected - as part of prelaunch testing.

Shortly after the spacecraft arrived at Cape Canaveral, a payload aliveness test was performed. The X-Ray Spectrometer (XRS) instrument was reinstalled, and a comprehensive performance test of the instrument was successfully completed. Minor issues were addressed on some of the other payload instruments.

Education and Public Outreach Highlights
Stephanie Stockman, E/PO Team Project Manager, gave a MESSENGER E/PO overview to the Minority University Space Interdisciplinary Network (MU-SPIN) principal investigators at their annual meeting on Feb 20 in Baltimore. She also led a discussion about MU-Spin/MESSENGER teacher workshops for Spring 2004.

Stockman presented material on the MESSENGER mission to 30 in-service and pre-service teachers at Elizabeth City State University in North Carolina on 23 March. She also participated in a workshop on "Learning from the Frontier: Getting Planetary Data in the Hands of Educators," held on 14 March at the Lunar and Planetary Science Confrence in Houston. The workshop had 80-100 participants. Principal Investigator Sean Solomon delivered a seminar on "The

MESSENGER mission to Mercury: Seeking clues to the formation and evolution of the inner solar system" jointly to the Space Telescope Science Institute and the Department of Physics and Astronomy of The Johns Hopkins University in Baltimore in March.

MESSENGER was featured in a cover article on "Mission to Mercury" in the April issue of *Discover* magazine, available at newsstands throughout the month of March.

Deep Impact Testing Continues

In February Deep Impact achieved a major milestone. The testing program had previously uncovered a number of problems in the spacecraft computer. In mid-January the team finally determined how to deal with all of the identified problems and sent the computers out to have the circuit boards modified to correct the problems. In late January they also released the latest upgrade to the spacecraft operating software. This release included changes that allowed them to fix some hardware issues that were more easily fixed in software than in hardware.

The flyby (hanging) and impactor (on the floor) spacecraft were joined, or "stacked" on April 7th at Ball Aerospace and Technologies Corp. where they were built and prepared for environmental testing.

Recent weeks have been very busy for the project. The biggest achievement was to have completion of the final mating of the impactor and flyby spacecraft (see photo). This implies that mechanically the system is ready for environmental tests. The two spacecraft will be separated once more, after vibration tests, in the thermal-vacuum chamber, to test the thermal properties of the impactor when it is separated from the flyby the day before impact. Meanwhile, the extensive program of testing the software that operates the spacecraft and the instruments continues.

The project conducted a major review of all the previously identified risks. After considerable effort, they were able to eliminate at least half the risks as being negligibly small, allowing them to concentrate on those that are more significant.

New Manager Named

Rick Grammier was named the new Deep Impact Project Manager in January, when John McNamee was promoted to Discovery/New Frontiers Program Manager.

Rick earned a B.S. in engineering from the U.S. Military Academy and an M.S. in electrical and computer engineering from Cal Poly. He came to JPL in 1988 from Ultra Systems Defense & Space. His recent assignments have included deputy manager and project engineer on the Stardust mission, manager of the Office of Mission Assurance, and most recently he was the deputy director for Planetary Flights Projects.

Education and Public Outreach Highlights

The Deep Impact project moved to its "One Year to Launch" position on December 30th of 2003. Over 625,000 names were submitted to the Send Your Name to a Comet campaign and the CD with all names is now safely attached to the impactor spacecraft. One of the names submitted was the Tournament of Roses to celebrate the JPL float entry in the 2005 Rose Parade.

Deep Impact personnel participated in the Planetary Society's "Wild About Mars" celebration at the Pasadena Civic Center in early January. A series of articles about the Deep Impact mission were featured on the NASA web site for kids, educators and students. Wired Magazine also featured the mission in their January issue. The project's E/PO team met with staff at the Kennedy Space Center in February to kickoff their collaboration for December's launch activities.

Members of Deep Impact's E/PO team have been coordinating with the Office of Space Science to further develop the mission's commitment to the Girls Scouts, both locally and nationally. Project members have been giving workshops to all levels of scouts using a song to teach comet facts, a hands-on activity making comet models to test what they have learned, and a mythical comet story to further test their new knowledge.

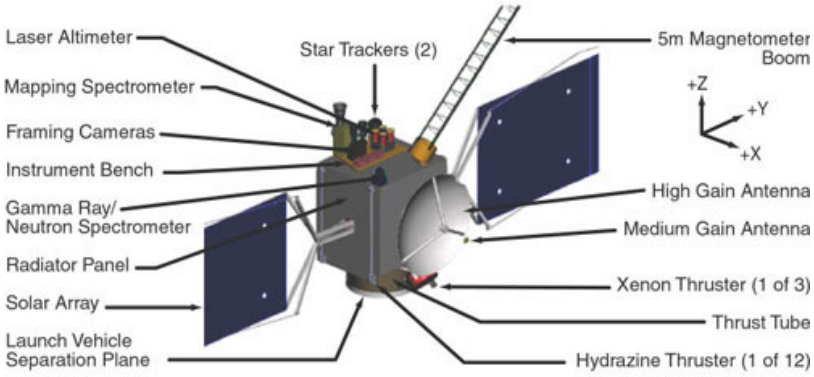
Making use of technology capabilities at JPL, Deep Impact E/PO personnel gave a video conference workshop to teachers at three locations in South Carolina simultaneously, originating at Roper Mountain Science Center in Greenville, SC. Teachers were given an overview of the mission and participated in a hands-on activity. The workshop was a partnership with one of NASA's local Solar System Educators, Garrison Hall.

The Deep Impact EPO team from University of Maryland and McREL in Aurora, CO, presented a workshop at the National Science Teachers Association annual convention in Atlanta, GA, on April 1st, titled "Strategies for Teaching About Controversy in Science". After listening to teachers discuss how they had dealt with controversial topics including Roswell, NM, and aliens, the age of the universe and religion, and evolution and religion, the team presented a controversial, yet non-emotional real topic within the Deep Impact mission regarding the decision for the time of day to impact Comet Tempel 1. Two activities designed for Deep impact by McREL were demonstrated in which students represented different points of view including those of engineers, managers, scientists, and E/PO representatives. This led to interesting discussions and development of a plan for decision making.

The Deep Impact mission also finished production on both a planetarium show produced by Fiske Planetarium in Colorado and a video animation story of the mission. In March, the ninth issue of Deep News, the project's e-mail newsletter, went out to over 13,000 readers who signed up to receive it at the same time they entered their names to be sent to Comet Tempel 1.

Dawn Proceeds Towards Critical Design Review

On February 6, Dawn, a mission to explore asteroids Ceres and Vesta, was confirmed and approved by NASA management to move into its implementation phase. To respond to an increasing emphasis within the NASA Office of Space Science to mitigate risks of schedule slips and growth in cost, mass and power consumption, the Dawn team took steps to improve the mission's technical margins and the financial and schedule reserves. As a result, there have been several changes in the mission profile since the original Concept Study Report. These have increased the robustness of the mission but at some expense to the science return.



Dawn spacecraft

The first adjustment was an increase in the solar array output so that Dawn can always operate its ion thrusters with adequate margin to allow for unexpected power requirements. To accommodate the tighter mass and power box, a Mars flyby was inserted into the trajectory, but this delayed Vesta and Ceres arrival and thus increased the operations costs. Dawn could not afford to extend its time in space and remain within the cost cap. The Dawn spacecraft provider, Orbital Sciences Corporation, made a generous contribution to the project that will allow it to achieve its prime goals within the cost cap and with responsible technical and cost reserves. However, to accomplish this the stay times at Vesta and Ceres have been reduced from 11 months at each body to 7 months at Vesta and 5 months at Ceres. This amount of time allows all imaging and mapping spectrometer data to be obtained, and achieves the prime objectives of the gamma ray and neutron detector (GRaND) and gravity investigations, but the stay time does not allow the spacecraft to spiral down as far as originally planned so that resolution of GRaND and the gravity data are somewhat reduced. Part of the increase in the mass margin and cost reserve has also come from the deletion of the magnetometer and its boom.

The mission is now in the implementation phase and is moving forward quickly toward launch. Great progress has been made with the spacecraft, the instrument payload and the ground system. All spacecraft subcontractors are on board and hardware is beginning to take shape.

On April 13, an independent power and mass margin review was successfully conducted, confirming the project's assessment of health. The technical reserves of the project are appropriate to the mission phase. Schedule reserve continues to be tight; however, an aggressive schedule is key to executing a successful low-cost mission.

Education and Public Outreach Highlights
On March 14, Joe Wise, Dawn E/PO manager, participated in the Lunar and Planetary Science Conference E/PO discussion on the use of NASA's extensive planetary data in the classroom. Joe served on the discussion panel and led one of the sessions. The Dawn mission plans to use archived images of craters on other solar bodies to inform people about the process and importance of cratering. With this information, we will build anticipation and expectation for the arrival of the visual images from Vesta and Ceres.

The Dawn mission presentation at the National Science Teachers Association (NSTA) annual convention in Atlanta in April offered teachers a trip to the asteroid belt and several engaging, standards-aligned instructional materials to use in the classroom upon their return.

This workshop session engaged teachers in the wonder and curiosity that is inherent in discovery. Through a series of vignettes, participants learned of the early history of asteroid discovery. Then, in a collaborative hands-on activity, participants became the "Celestial Police" of the early 1800s as they searched sky charts for a moving asteroid. The student activity, vignettes, and accompanying teacher guide, all from the middle school module, "The History and Science of NASA's Dawn Mission," provided a historical context and enabled participants to learn more about the mission.

Kepler Development On Track

The Kepler Mission to explore the structure and diversity of planetary systems and search for Earth-size planets outside our Solar System is proceeding through the development phase, working cost and technical issues, and preparing for the preliminary design review scheduled for October.

Education and Public Outreach Highlights
Riley Duran represented Kepler in the Venus Transit Webcast on March 19, which was a huge success. He did a fabulous transit demonstration with a student volunteer. Archive of the webcast is at http://planetquest1.jpl.nasa.gov/venus_transit.cfm

A Kepler Transit classroom activity was presented to teachers in 3 sessions at NSTA in Atlanta, GA, April 2: (a) DeKalb County School District (Atlanta) professional development workshop, Matt Grabowski presenting; (b) a one-hour workshop on Planet Finding, Alan Gould presenting; (c) a 20-min version of the transit activity at the Astrobiology Event, Alan Gould and Denise Smith presenting. Also Jill Tarter, featured speaker at NSTA, presented Kepler in the context of searching for life in the universe, with about 100 people in attendance.

Work on the Great Explorations in Math and Science (GEMS) Space Science Core Sequences (SSCS) is progressing nicely. There was a GEMS staff meeting for debriefing the field test of the SSCS grade 3-5. We are also working with Origins Forum, Sun-Earth Connection Forum, and Solar System Exploration Forum people to map out the SSCS grades 6-8 sequence.

The Alien Earths prototype transit/orrery museum exhibit, designed by Filament Design under subcontract from Space Sciences Institute and Kepler, is being used by Kepler personnel in presentations. It will be used at the JPL Open house event in May and the Kepler booth at AAS May 30-June 3. The exhibit consists of a model star (light bulb) at the center with two planets orbiting when the visitor turns a hand crank. There is a Vernier light sensor (representing the Kepler photometer) that connects to a computer display that shows a light curve of transits occurring. We also have a prototype LEGO version of a transit exhibit nearly finished and plan to design a Knex version as well, so that others can fairly easily build a Kepler transit/orrery demonstration system.

Alan Gould raises the outer planet ring on the prototype Kepler planet transit/ orrery exhibit.

New Discovery Bookmark Shows the Human Faces of Robotic Exploration

This Discovery Program has created a new bookmark that illustrates the human joy of scientific learning acquired through the engineering feat of sending robotic instruments to faraway destinations.

The image shows members of the elated Stardust team on Earth, after receiving communications from NASA's Deep Space Network to confirm that their close encounter with a speeding comet was a brilliant success. After traveling 2 billion miles in just under 5 years, the Stardust spacecraft captured samples of comet dust and took the most detailed pictures ever of a comet's surface. The return journey to Earth is now underway, and the sample return capsule will parachute to the ground in January 2006.

Stardust team members shown are, clockwise from left, Aimee Whalen (Opportunity and Outreach Manager), Dr. Don Brownlee (Principal Investigator), Tom Duxbury (Project Manager), Bob Ryan (Mission Manager), and Rham Bat (Maneuver Analyst).

The image fades to a beautiful infrared view of space recently taken by the Spitzer Space Telescope and shows the MESSENGER spacecraft and its target Mercury, the Discovery Program's next scheduled launch.

The back of the bookmark has a brief description of all the Discovery missions.

Download this bookmark.

Discovery Dispatch

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