Discovery and New Frontiers News

A Quarterly Newsletter of NASA's Discovery and New Frontiers Programs

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A Note From the Program Manager

Hello to all from "the new kid on the block". I can't begin to tell you how exciting it is to be working these Programs. When I got the call, I was in a bit of a "post launch funk". Gravity Probe B, a mission I had been working for three years, finally launched in April, and I was heading back to Auburn to finish up my PhD. I'm sure those of you who have been on major launch campaigns can relate. You work, sweat, bleed, and strive to a goal, get your day in the sun, and then you look around and wonder where everybody went.

But things have a way of working out. A month after the call, MESSENGER blasted off for Mercury. Then Genesis brought home its precious bounty. Now we're in the final sprint for Deep Impact's tumultuous date with comet Tempel 1. New Horizons is well into its I&T Program, and Dawn is on the brink of ATLO. ASPERA is quietly making noise, gathering and beaming data back from Mars to an anxious science community. Stardust is on its way home, following its sister's path. Discovery AO number 11 is in play, and AO 12 is just around the corner. Our Center Director recently visited JPL and noted how happy and content the team members seemed. I now know why. You've got the best jobs in the world!

A local news outlet asked me to make a statement about the Programs. A single image came to mind: Captain James Cook (Captain Kirk's namesake). I recently read Tony Horwitz's biography and was awestruck by Cook's story. He circumnavigated the Earth three times and "discovered" New Zealand, Australia, and two-thirds of the Earth's islands. To do this, he pushed the limits of the technology of his day, a sextant. He used innovative ideas, such as eating native plants to curb scurvy. He was chartered by the British Royal Society, formed in the 1600's as a forum to discuss scientific issues, and consequently Cook considered science as a primary objective. He always took a scientist with him to take data and in some cases bring back "samples" they found along the way. His ship's log notes that he and his shipmates observed the 1769 Venus transit across the sun from the Island of Tahiti! (see page 8)

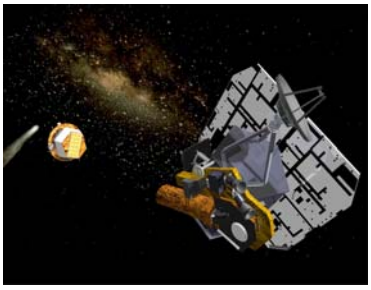
You are all Captain Cooks, setting off to explore and understand these "islands" and "continents" within our Solar System. You'll land on some. You'll simply observe others as you sail by, but you'll bring back knowledge and expand our understanding. I get the same feelings talking to you and watching your progress that I did reading Horwitz's book. I'm envious of you, excited for you, and humbled by your achievement.

Sail on!
Todd

Deep Impact – A Groundbreaking Mission

Out-of-this-world fireworks 83 million miles from Earth will celebrate the 4th of July in 2005, created by the Deep Impact spacecraft as it collides with comet Tempel 1 to give scientists a glimpse into the past.

Planned for launch from Cape Canaveral Air Force Station in Florida on Jan. 12, Deep Impact is a two-part spacecraft that will take a one-way, six-month journey back to the future to answer questions about the formation of the Solar System, the nature and composition of comets, and the role that cometary impacts may have played in Earth's early history and the beginning of life on our planet. It's the first mission ever to attempt impact with a cometary nucleus in an effort to discover the secrets that lie beneath its surface.



This artist's rendition shows the flyby spacecraft releasing the impactor, 24 hours before the impact event.

The two-part spacecraft consists of a larger "flyby" spacecraft carrying a smaller "impactor" spacecraft. The 820 lb (372 kg) impactor is a battery-powered spacecraft designed to operate independently for just one day. After release, the impactor will take over its own navigation and maneuver into the path of the comet. Scientists believe Deep Impact will produce a crater that could range in size from a house to a stadium. The impact is expected to eject ice and dust from the surface of the crater and reveal untouched, primordial material beneath. A camera on the impactor will capture and relay images of the comet nucleus just seconds before it collides with the comet. After separation, the flyby spacecraft will

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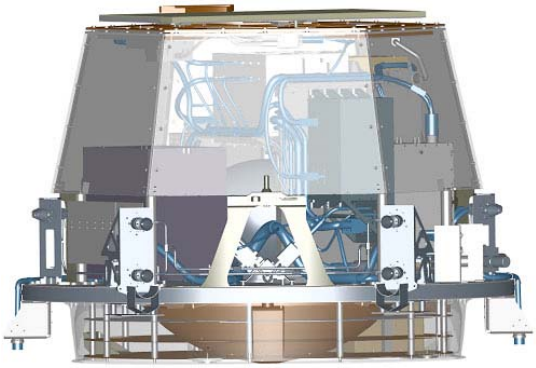
observe and record the impact, the ejected material blasted from the crater, and the structure and composition of the crater's interior.

Sequence of Events
After launch on a Delta 7925 rocket, a series of events take place which culminate with the spacecraft being released on its trajectory to comet Tempel 1. Mission controllers will establish communications as soon as possible to assess the health of the spacecraft and respond to any anomalies. The first downlink is expected to occur 11 to 15 minutes after separation via NASA's Deep Space Network tracking complex near Canberra, Australia, as Deep Impact heads east over the Indian Ocean and out of Earth orbit.

The next 30 days are a time of initial operation, checkout and calibration for the spacecraft and payload instruments. Thrusters will be fired to correct for any errors in the flight path. During this phase, the spacecraft's scientific instruments will be tested using the Moon as a calibration target. The autonomous navigation system will be tested using the Moon and Jupiter as practice targets.



This "X-ray" view of the impactor, which is 39" long and 39" in diameter, shows the forward section, a series of copper plates forming a dome shape designed to make the density of the impactor match the anticipated density of the comet, thus opening up a large crater. The back section contains the battery, electronics, computers, propulsion equipment and steering instruments.

During the three months that follow**,** as the spacecraft flies toward the comet, the mission team will conduct scientific calibrations, an encounter demonstration test, ground operational readiness tests, and a second trajectory correction maneuver.

The team expects the spacecraft to be able to detect comet Tempel 1 in its high-resolution camera about 60 days before encounter. This milestone marks the beginning of an intensive period of observations to refine knowledge of the comet's orbit. Regular scientific observations will be used to study the comet's rotation, activity and dust environment. This time is crucial, as the team will have only one chance at the 4-mile-wide comet Tempel 1 and need to hit it on the sunlit side so scientists on Earth can see the resulting collision.

The encounter phase begins five days before and ends one day after the impact with comet Tempel 1. This brief but very intense period includes two final targeting maneuvers, leading up to release of the impactor and its dramatic collision with the comet's nucleus. Since the comet travels substantially faster than the spacecraft, the comet actually runs over the spacecraft at a relative velocity of about 22,820 miles per hour (10.2 kilometers per second). The kinetic energy released by the collision event will be 19 gigajoules, which is about the equivalent of the energy released by exploding 4.5 tons of TNT, which is about the amount of energy used in an average American house in one month.

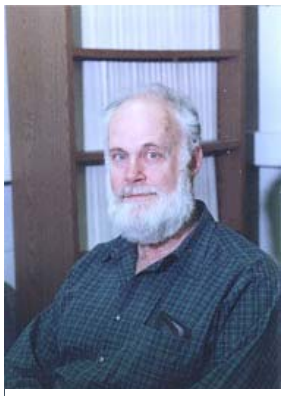
Meanwhile, after releasing the impactor, the flyby spacecraft will execute a deflection maneuver to put it 311 miles (500 kilometers) from the comet nucleus, close enough for a good view but far enough to survive the intense dust environment of the inner coma. The maneuver will also slow it down sufficiently to observe the impact, the resulting crater and ejected material, before transmitting these data to Earth.

The impact with the comet on July 4, 2005, will be observed by the major observatories at Mauna Kea on the island of Hawaii (where it will still be the evening of July 3). NASA's Chandra, Hubble and Spitzer space telescopes will be observing from near-Earth space while hundreds of miles below, professional and amateur astronomers on Earth will also be able to observe the material flying from the comet's newly formed crater.

Transmission to Earth of data taken during the impact and subsequent crater formation will begin the next day and continue for 30 days. Observations of the departing comet will continue for 60 hours after impact to monitor changes in the comet's activity and to look for any large debris in temporary orbit around the nucleus.

Then the fun begins for the scientists as they analyze the data gathered from the array of on-board instruments, including the most powerful camera yet to fly in deep space, to uncover clues about the early Solar System and our own origins.

Mike A'Hearn – Deep Impact Principal Investigator



Mike A'Hearn

Mike A'Hearn has always been curious about how things work. Born in Delaware and raised in Massachusetts, Mike played sports, was an avid reader, enjoyed scouts, boating, and other outdoor activities. He got a degree in physics from Boston College, where he became interested in astronomy as a senior. "I was getting bored by theoretical physics courses and wanted to do something more applied," he recalled, "I had taken one summer course in astronomy and that seemed to be an interesting version of applied physics so I decided to go to graduate school in astronomy." He earned his PhD at the University of Wisconsin at Madison, then became an assistant professor of astronomy at the University of Maryland, where he has taught and conducted research ever since. His distinguished career includes innovative research on comets including development of new observational techniques to study them, more than 100 published papers, and service on many prestigious committees and panels. He also is manager of the Small Bodies Node of NASA's Planetary Data System.

While Mike is the Principal Investigator for Deep Impact, he

says the concept for the mission did not originate with him but with Mike Belton and Alan Delamere, a scientist and an engineer who were serving on a panel reviewing proposals to look at pristine material in comets. They realized none of the proposals would get down deep enough inside the comet to have much hope of finding the primitive materials, and they came up with the original idea for the Deep Impact proposal. However Mike said the general idea had been around much earlier, during the Comet Rendezvous Asteroid Flyby or CRAF project, that was to be part of the Cassini mission until CRAF was cancelled due to budget constraints. Belton and A'Hearn were both associated with CRAF, which may have been the first serious look at what could be done with an impact to a comet.

Mike recalls they assembled the team for Deep Impact in 1995 and submitted the proposal in 1996 with Mike Belton as the PI. That proposal wasn't funded because the science panel was not convinced that the target, Phaethon, was a comet or that they could hit it.

But the idea evolved and in 1998 Belton asked Mike A'Hearn to take over as PI. This time they proposed to hit an active comet, Tempel 1, and added a guidance system to the impactor. This approach convinced reviewers they could hit the comet, and Deep Impact became the eighth Discovery mission.

Since work began on the mission in January of 2000, Mike has persevered through numerous changes in management, contracts, and engineers at JPL, NASA and Ball. He jokes if he were to do this again, nobody will work with him. But on the serious side, there have been effects on the mission and on him personally. "The biggest effect, "he said, "is within the last year I've had to go on medication for high blood pressure. I don't know to what extent that's associated but it probably is. It's been far more stressful than I ever anticipated, largely because of the cost issues. Schedule issues are not such a big thing for me because we've always had the one year back up available. But the cost issues have been very stressful, and the changes of personnel certainly have mattered. Any time you swap personnel on a short mission with a tight schedule and budget, you're bound to have an impact."

Mike's advice for new PIs? "The single most important lesson for any incoming PI who is relatively new to the game is to emphasize communication between the PI and the people on different parts of the project and do it almost on a weekly basis, so no elements of the project get disconnected from each other."

With all the challenges that are part of his role of managing the mission, Mike keeps his eyes on the prize of the pay off with tremendous science in another 6-1/2 months. "We will be getting good data on the comet probably for the last two months of cruise," he said, "but the crucial data will come down the day or two after encounter." He hopes to be spending a lot of time after encounter doing data analysis. "I expect that analyzing both the mission data and the associated Earth-based observations will be my primary activity for the year following the encounter," he said, "and I plan to continue doing analysis for many years after that but not necessarily as my primary activity anymore."

Like every Discovery mission, Deep Impact will no doubt provide many answers while raising even more questions. "It's an exploratory mission because we don't really know what's going to happen in the impact," Mike said. "We have so many widely varying predictions. Doing an experiment of this type that's never been done before is aimed at exploring how comets behave when you hit them. That is going to lead, I think, to a wide array of new explorations in theory, trying to understand why the comet behaves the way it does, why we find the particular differentiation of ices between the relatively pristine interior and the evolved surface, why the crater ends up the shape and size it does. I anticipate there will be a lot of activity generated because we will not understand many of the phenomena that we see. This should give us insight into what the next mission should be to explore the interior, whether it's more important to do a different kind of experiment or more important to go to a different kind of target."

Clearly Mike has retained the child-like innocence that still inspires him to try and understand what's going on in the world, even as he navigates through the harsh realities of management.

Rick Grammier – Deep Impact Project Manager

Rick Grammier

Rick Grammier took on a daunting role last January when he joined the Deep Impact team as its fourth project manager at a time when the mission faced many difficulties which resulted in delaying the planned January 2004 launch by one year.

Rick faced the challenges head-on. No doubt his background has played a big role in his guiding the project and bringing it to the launch pad less than 12 months taking the helm. Rick was born in Austin, Texas, then lived in the small border town of Eagle Pass until 6th grade, when his family moved to Roswell, New Mexico. As a young boy, he liked to play football more than anything. A knee injury forced him to give it up but led him to find his real calling, which was gymnastics. He became the New Mexico state champion on the side horse.

Rick was influenced by both of his parents. His mother was a high school math teacher and his father was a Korean war veteran. He says he wanted to attend the U.S. Military Academy from the time he was about 7 years old. "It just excited me and interested me," he recalls, "I was really gung ho on that." He graduated with a B.S. in engineering and had every intention of making the Army his career. "But that was in the days before Reagan came on board," he said, "It became a little too difficult to raise a family on the pay. My family was obviously more important, so I decided to get out and try something else."

His first job after leaving the military was working for a firm that designed microprocessor energy based management systems for buildings. From there he went to Ultrasystems Defense and Space, working in Arizona at the Army's electronic proving ground. In time he transferred to California to pursue a master's degree and work on a Milstar satellites contract. "That's how I learned about JPL," he remembers, "I said, 'hey, I want to do that, that's cool' so I went to JPL."

He got his master's degree in electrical and computer engineering from Cal Poly and joined JPL in 1988. His recent assignments have included deputy manager and project engineer on the Stardust mission, manager of the Office of Mission Assurance, and most recently deputy director for Planetary Flights Projects.

Rick has led the project with determination and discipline. "It's been probably the biggest challenge I've had to deal with, and I've had to deal with some big challenges. When you come into a project that's been in trouble and you only have a year to turn it around, it takes a lot of time. I've been on the road constantly." For a long time he spent three days each week in Boulder, Colorado, at Ball Aerospace, where the spacecraft was built. But now he is seeing a light at the end of the tunnel.

His biggest concerns as launch approaches are closing out the final paperwork and data analysis, two big items. After that he will work on making sure the operations team is all set and ready to go. "We're training hard with them," he said, "We've been doing a lot to get the team up to speed, to make sure all the operations processes are in place. It's been somewhat difficult because a significant portion of the ops team is from Ball, and they've never flown a JPL deep space mission before. We're teaching them how we do operations from a JPL viewpoint from the ground up, so that's a challenge because we have such a short mission."

Once Deep Impact launches, it's a short six months until encounter with the comet. "We have a lot of activity crammed into the six month cruise time," Rick said, " And we still have testing to do for the encounter itself. Even though we've proven the basic functionality and have the basic sequence, there's still a lot of tweaking and additional testing to be done. It's not going to slow down very much. After encounter we plan to send data back for 30 days."

When Deep Impact ends, Rick needs to catch up on family time before he jumps into the fire for another mission. He has five children, including two young soccer-playing ones at home who have seen a lot more of Mom than Dad lately. His oldest son is a mechanical engineer, another just graduated and got his commission in the Army as a 2nd lieutenant, and another is in college.

What advice does he have for students who want to work in space exploration? "Work hard at your education and don't limit yourself to excel in just one subject. Space exploration isn't limited to just a few areas, the possibilities are boundless. Explore different subjects and find out what you like. Then, figure out where and how to apply it to your space exploration desires. You must like what you do, because you are going to spend a long time doing it. Listen to advice and think about it, but you must decide your direction. No one else can do that for you."

Marshall Selected to Manage Discovery and New Frontiers Programs

NASA's Marshall Space Flight Center in Huntsville, Alabama, is the new home of the Discovery and New Frontiers Program Office. Todd May, the new program manager, will lead the team responsible for assuring the availability of technical expertise to quickly assess and manage the required support structure needed by the missions. Todd, and his wife, Kelly, have four children ranging from 1 to 9 years old. They enjoy all kinds of outdoor activities, particularly hiking, camping and trips to the beach.

Todd May

Most recently May served as the program integration manager for the Gravity Probe B Program which is testing Einstein's theory of relativity. He was responsible for managing cost, schedule and flight readiness of the spacecraft, as well as education and public outreach for the mission. Graduating from Auburn University in 1990 with a bachelor's degree in materials engineering, May started his career at NASA in 1991 as an engineer at the Marshall Center's Materials and Processes Laboratory. He relocated to NASA's Johnson Space Center in Houston, Texas, in 1994, leading a team that evaluated materials and processes used for the Space Station. In 1996, he became deputy manager of the team working with Russia on the Space Station. In 1998, May returned to the Marshall Center to lead the team constructing the International Space Station "Quest" Airlock module.

The Discovery Program Office was established at JPL in 1999 and has now been combined with New Frontiers since the two programs share a similar approach to exploration. New Frontiers has a larger cost cap and the missions will address high-priority exploration initiatives in the Solar System identified by the National Academy of Sciences.

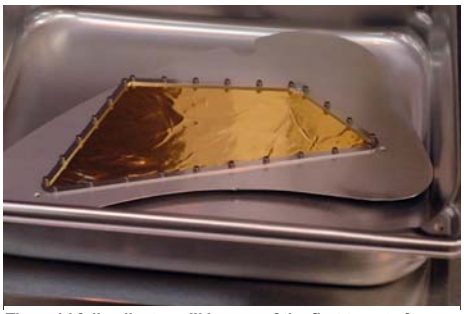
The Marshall program office will assist the Science Mission Directorate at NASA Headquarters with program management, technology planning, systems assessment, flight assurance and education and public outreach. Marshall Center Director David King said, "These programs comprise some of the most exciting missions in Solar System exploration. They provide opportunities for science robotic missions and lay the groundwork for future exploration of the Solar System and beyond."

The Discovery missions are focused scientific investigations that complement NASA's larger planetary explorations. The goal is to launch more frequent lower cost missions with faster development times. Ten Discovery missions have been selected to date. The first New Frontiers mission, called New Horizons, will fly by the Pluto-Charon system in 2014 and then target other Kuiper belt objects. NASA recently chose two mission proposals under the New Frontiers program for preformulation study, with selection planned in the spring.

Genesis Scientists Remain Optimistic

After a "hard landing" in the Utah Test and Training Range on Sept. 8, 2004, the Genesis sample return capsule seemed to hold little hope for scientists who were anxiously waiting to unlock the mysteries inside. But three months after that shocking event, there is real optimism from the curation team

that valuable science will result from the collector arrays and the concentrator.



The gold foil collector will be one of the first targets for attempting to extract nitrogen.

Initially it seemed the only good news on the morning of Sept. 8 was that the capsule didn't land parachute side down on the pyrotechnic devices that were to deploy the drogue chute. In that case it could have exploded or not been able to be made safe. As it was, they were able to de-mate the pyro devices. The goal then was to get the science canister out and take it to the clean room at Dugway Proving Ground. This was accomplished by 6 pm. Because the bottom of the canister was sheared off, the team decided to turn it over on its lid and work with it upside down, to keep it as intact as possible. It made the work very awkward, but according to Dr. Eileen Stansbery, contamination control and curation lead from NASA's Johnson Space Center (JSC), "It was a tough decision but turned out to be the right one." They worked upside down with mirrors to remove the thermal protection shields, the rumpled polished aluminum collector, the foils which were intact but bent, and the wafers which ranged from full size to tiny pieces. Meanwhile, other team members spent two more days at the landing site, picking out tiny pieces of collectors in the dirt. They had prepared for this worst case scenario and were equipped with buckets containing trowels, tweezers, and zip lock bags.

Ultimately an estimated 10,000 pieces were documented and individually packaged. The first samples arrived at JSC on Monday, Oct. 4, where they were numbered and packaged, then moved to the Genesis clean room where they will be preserved and protected. Scientists are optimistic that Genesis solar samples will provide important information on the history and origin of the solar system. They are developing methods and techniques to deal with the contamination issues. Stansbery says, " We are currently determining the amount of contamination the sample collectors have. We are also developing techniques to clean the Utah mud and other contaminants off. We need to be smart how we use controls and what controls are used. For Early Science we will extract noble gas from the polished aluminum collector and nitrogen from the gold foil collector." The samples will be distributed to scientists to study over the coming months and years.

In October after analyzing the Genesis capsule at a facility near Denver, the Mishap Investigation Board said that the likely cause for the failure of the parachute system to open was a faulty design that resulted in the gravity switches which sense deceleration as the capsule enters the Earth's atmosphere being improperly installed on a circuit board. The board's investigation should be concluded soon.

Education and Pubic Outreach Highlights

Genesis held an educator's workshop in Salt Lake City on August 3-4. Thirty-Four attendees included educators from Salt Lake City and Tooele, Utah, and NASA's Solar System Educators and Ambassadors. They participated in hands-on workshops and learned activities which focused on the Genesis mission and its sample return efforts.

Genesis also participated in the annual Solar System Educators Program training institute in Salt Lake City which followed the Genesis educator workshop on August 5-8. Thirty-eight educators attended the three-day event which included training on the Mars, Cassini, Deep Impact, and New Horizons missions.

The grandchildren of Principal Investigator Don Burnett joined the crowd at the University of Utah to watch the sample return event.

The Genesis mission would like to thank all those who supported the sample return on September 8th. Numerous museums, planetariums, and Challenger Centers have reported overwhelming numbers of attendees at "Genesis Earth Return" Events. Despite a hard-landing the Genesis Recovery Operations are going ahead as planned and sample particles are expected to be released within the next few weeks to the mission's science team for analysis.

The E/PO team held a series of Summer Academies, leading up to the sample return. Events took place in Slippery Rock, PA, Houston, TX, Denver, CO, Salt Lake City, UT, and Wichita, KS.

The Genesis team has been getting letters and postcards from students. Read them on the web site: http://genesismission.jpl.nasa.gov/product/genesis_kids/letters.html

MESSENGER Continues on Course

After a spectacular launch on August 3, MESSENGER is now about 98 million miles (157 million kilometers) from the Sun and 27 million miles (43 million kilometers) from Earth. At that

Mission operations team members at APL monitor MESSENGER during the trajectory correction maneuver.

distance, the amount of time for a signal to reach the spacecraft from Earth is 2 minutes, 23 seconds.

Since liftoff, MESSENGER's onboard computers have executed 20,254 commands from mission operators. The third trajectory correction maneuver since launch, on Nov. 18, eased it into a cruising speed of about 62,030 miles (99,827 kilometers) per hour and tweaked its course toward the Earth flyby next August. The solar-powered spacecraft continues to fly with its sunshade away from the sun, allowing it to keep its key systems warm without using power for heaters.

Detailed checkouts of the science instruments and subsystems continue. The first Mercury Dual Imaging System (MDIS) instrument calibration test since launch took place on Nov. 29. On Dec. 8, the spacecraft spent three hours looking for a star to confirm that the Mercury Atmospheric and Surface Composition Spectrometer (MASCS) instrument was functioning as designed. These observations were part of the instrument's first post-launch calibration and maintenance operation since the commissioning checkout early in the mission that certified it had survived the intensity of launch. Science and engineering teams are analyzing the results of both instrument tests.

Education and Public Outreach Highlights

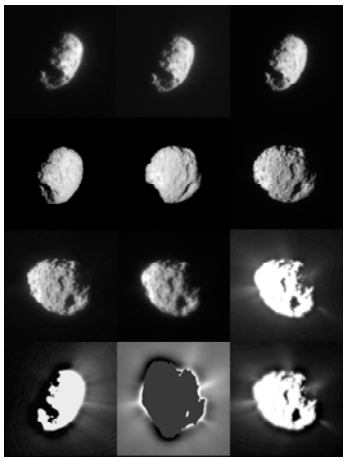
The second MESSENGER Fellowship Training Workshop was held at Cocoa Beach, FL, on July 29 – August 2, 2004. The workshop, aimed at providing new MESSENGER Educator Fellows with the tools necessary to carry out their programs during the 2004-2005 academic year, was scheduled to coincide with the launch of the MESSENGER spacecraft. A concurrent Update Session was conducted for the first group of Fellows who attended a training workshop in 2003.

E/PO lead Stephanie Stockman was an instructor in the NASA Solar System Educators Program summer institute held in Salt Lake City, UT Aug 5-8, 2004, on the University of Utah campus. Thirty-eight educators attended, including two MESSENGER Fellows. Stockman provided an overview of the MESSENGER mission, introduced the MESSENGER launch celebration CD and did the introductory lesson from "Ice In the Solar System" with the educators.

AAAS staff attended the 3rd Asia Pacific Youth Science Festival in Beijing, China, August 3-9, 2004. While attending the festival there was an opportunity to exhibit educational products from the AAAS. The MESSENGER mission was featured, and it was a big success. The exhibition booth fielded over 300 students, teachers and media reporters in less than 1.5 hours. The staff handed out promotional materials and demonstrated how to play with the "Make a Mission" program. The attendees were impressed and carried the information back to their home schools.

Stardust Cruises Back to Earth

As the Stardust spacecraft continues on its journey back to Earth with its cargo of comet dust, all systems are operating normally. The team has participated in many meetings since October to review Genesis flight operations lessons learned and sample return capsule lessons learned.



These are the closest images of comet Wild 2 taken by Stardust.

While the Stardust drogue and main parachute deployment design is similar to Genesis, the implementation is different. The Mishap Investigation Board preliminary findings were that Genesis G-switches were wired backwards but that the switches on Stardust do not have the same problem and should be OK. Even though Stardust is expected to land normally, the project team will be prepared, trained, and qualified for a hard landing.

Dawn Holds Successful CDR

The Dawn mission held a successful Ground Segment Critical Design Review on September 15 and 16th at JPL. Test plans are well-established and will be reviewed at the Assembly, Test, and Launch Operations (ATLO) Readiness Review on December 14 and 15th at Orbital Sciences in Virginia. All elements of the project are making progress without major technical problems. Schedule pressure continues, and the schedule is being aggressively managed.

A major milestone was achieved in October with the delivery of the flight core structure to JPL for integration of the ion propulsion system. Assembly of the solar panels is underway. Work has begun on the Dawn Science Center infrastructure at UCLA and the T1 line from JPL was installed, along with a Science Operations Planning Computer hosting the Ground Data System software. Dawn's flight software deliveries continue on schedule, and the first Flight System Test Bed is nearing completion.

A meeting of the Dawn Science Team is scheduled for January at UCLA. The team will also meet in Vienna, Austria, in April. These meetings will focus on development of the science plan which will be delivered in June 2005.

Education and Public Outreach Highlights

In Memoriam

Jane Galloway, the Dawn Business Manager, was killed in the tragic vanpool accident on December 8 that also took the lives of two other JPLers and injured seven. The program office extends sincere condolences to Jane's family, her friends and coworkers during this sad time of loss.

Dawn's Education and Public Outreach (E/PO) team is currently field testing its first education module, entitled "The History and Science of NASA's Dawn Mission." Teachers in Kansas and Pennsylvania are using the module in their classrooms and evaluating its utility. After completing the classroom field test cycle, the module will be released for formal and informal use in Fall 2005. In the past several months, the E/PO team has conducted presentations for the

Dawn mission at the California and Colorado Science Teachers Associations' annual conferences.

Would you like to keep abreast of Dawn news as it happens? Stay in the loop and sign up for the e-newsletter at: http://dawn.jpl.nasa.gov/DawnMedia/e_news.asp

Kepler Moves to Next Phase

The Kepler mission successfully completed its Preliminary Design Review (PDR) in October 2004, and subsequently its Confirmation in December 2004. The Confirmation is conditional but the exact conditions are yet to be specified.

The project has made good progress in its highest risk areas, i.e., CCD and optics development. The CCD contractor, E2V, has delivered mechanical, electrical, and engineering models CCDs and 11 of 50 flight models. The CCD test facility at Ball has been completed and certified and testing of the electrical model completed. The first of the EM CCDs was destroyed in a mishap that occurred at the end of November but a replacement spare is currently undergoing test.

The light-weighted, frit bonded face sheeted primary mirror assembly (PMA) has been delivered from Corning to Brashears for polishing. The schmidt corrector assembly (SCA) blank has been delivered and is undergoing edge preparation.

Many components for the spacecraft and the photometer are in the process of being ordered. Fiscal year funding constraints control the actual ordering of the parts. However, the overall schedule is still consistent with an October 1, 2007, launch.

Education and Public Outreach Highlights

At the annual Association of Science and Technology Centers conference in September and at the California Science Teachers Association meeting in October, the SETI exhibit booth had a LEGO tabletop orrery Kepler demonstration, along with mission fact sheets and lithos.

Alan Gould demonstrates the Kepler transit detection

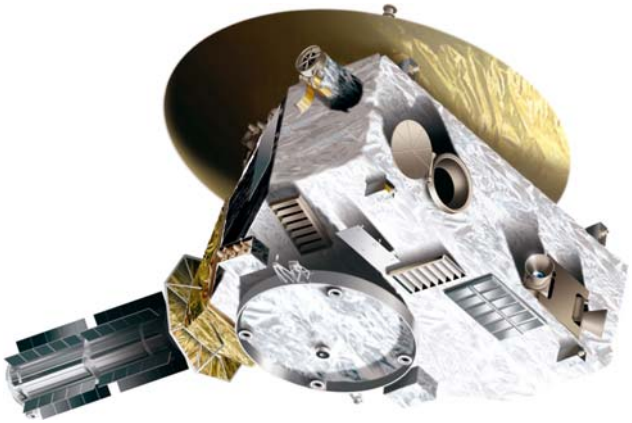
The annual meeting of the Western Alliance Conference (WAC) of Planetariums in San Diego in September featured E/PO team leads Edna Devore and Alan Gould who led a one-hour workshop on doing audience participation planetarium shows. Edna gave an overview of the Kepler mission, and participants made suggestions about what a Kepler show should accomplish. Kepler will partner with the Navigator team at JPL to jointly produce a planetarium program on the search for Earths. The request for proposals is expected to be released in the spring.

Kepler participated in the October NASA Earth-Sky Explorer Institute attended by 24 representatives from National Parks in Western United States. Alan Gould displayed and presented Kepler demos and activities and Jack Lissauer presented a talk on the mission.

Many members of the Kepler team have been giving presentations and demonstrations to students and the public across the country, including Nagin Cox from JPL who spoke to 250 people at the Milan Planetarium in Milan, Italy.

New Horizons Spacecraft In Integration and

The New Horizons mission to Pluto and the Kuiper Belt, the first mission in NASA's New Frontiers Program, is deep in its integration and test effort. As of December, the spacecraft structure has been outfitted with its propulsion system and with essentially all of the "A side" avionics. The redundant string, "B side" avionics and the flight IMUs are scheduled for integration in January and February. Also aboard the spacecraft are the star trackers, sun sensors, and five of the seven flight instruments.



Artist's conception of the New Horizon spacecraft.

An important project milestone achieved recently was the successful fourth flight of the Atlas V launch vehicle family on which New Horizons plans to fly.

New Horizons is scheduled for launch in January, 2006, and to encounter Pluto in July 2015. More information on the mission can be found at the mission's web site.

Education and Public Outreach Highlights

On November 18, 2004, New Horizons was the topic at the Maryland Science Center's SpaceLink Teacher Thursday program which offers informal introductions to the latest space science and astronomy developments. Alice Bowman, Mission Operations Manager from JHU/APL, and Alexandra Cha, New Horizons Educator in Residence from Glenelg Country School, presented "To Pluto and Beyond!"

In August, New Horizons participated in the NASA Solar System Educators Program (SSEP) training institute held in Salt Lake City, Utah. The SSEP is a nationwide network of 57 highly motivated teachers who lead workshops that show

other teachers how to successfully incorporate NASA materials and research into their classes. The SSEP educators were trained on the New Horizons mission by science team member Fran Bagenal from the University of Colorado and Alice Bowman.

New Horizons was one of the topics of the two-week Maryland Summer Center for Space Science Education camp in July held at JHU/APL. The program is for 30 6th and 7th grade gifted and talented students. Students worked in small groups to experience the process involved in designing a space mission. Students also toured APL and met with scientists and engineers while learning about careers in the space program.

Oil painting by William Hodges c Rue des Archives/The Granger Collection NY

The ships under command of Captain James Cook of the British Navy at anchor in Matavai Bay at Tahiti during the observations of the Venus Transit in 1769

Discovery and New Frontiers News

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