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Phoenix rises from Earth

Phoenix lifts off from Cape Canaveral Air Force Base Aug. 4.

By Guy Webster and Mark Whalen

Safely launched and its path to Mars adjusted in the right direction, JPL's Phoenix lander is well on its way to a Red Planet rendezvous next spring.

"The launch team did a spectacular job getting us on the way," said Project Manager Barry Goldstein. "Our trajectory is still being evaluated in detail; however, we are well within expected limits for a successful journey."

Indeed, six days after its Aug. 4 liftoff from Cape Canaveral Air Force Base in Florida, Phoenix performed the first and largest of six course corrections planned during the spacecraft's flight to Mars. The first trajectory-correction maneuver was calculated to tweak the velocity by about 18.5 meters per second (41 mph). The spacecraft fired its four mid-size thrusters for three minutes and 17 seconds to adjust its trajectory.

The next trajectory correction is scheduled for October, with others to follow when the spacecraft nears Mars. One correction is planned for April and three others for May, including the final one on landing day, May 25.

"All the subsystems are functioning as expected with few deviations from predicted performance," said JPL's Joe Guinn, Phoenix's mission system manager. "We've been very fortunate to not run into any anomalies at all."

"Everything is going extraordinarily well," Goldstein added.

The key activities in the first few weeks of flight will include inspections of science instruments, radar and the communication system that will be used during and after the landing. Goldstein said that in-flight calibration tests of Phoenix's instruments would be conducted about every week or so during the cruise phase of the journey.

The first instrument to undergo in-flight checkout was the Thermal and Evolved-Gas Analyzer, on Aug. 20, followed by calibration of Phoenix's robotic arm temperature scoop near the end of the month.

To be monitored in September are the robotic arm's camera and the Microscopy, Electrochemistry and Conductivity Analyzer, as well as the calibration of the Surface Stereoscopic Imager's camera.

The only Phoenix instrument not requiring checkout during the early cruise phase is the Mars Descent Imager, Guinn said, which won't undergo such scrutiny until Feb. 25. The camera will take a downward-looking picture during the final moments before Phoenix lands on Mars.

Meantime, an overall operations readiness test is scheduled for the first week of October at Phoenix's operations center at the University of Arizona in Tucson, which maintains a testbed facility to help iron out potential issues discovered in testing. Guinn said this capability gives him and the team confidence that the journey will proceed trouble-free.

Phoenix will be the first mission to touch water-ice on Mars. Its robotic arm will dig into an icy layer believed to lie just beneath the surface. The mission will study the history of the water in the ice, monitor weather of the polar region and investigate whether the subsurface environment in the far-northern plains of Mars has ever been favorable for sustaining microbial life.

"Water is central to every type of study we will conduct on Mars," said Peter Smith of the University of Arizona, the mission's principal investigator.

Phoenix is the first of NASA's competitively proposed and selected Mars Scout missions, supplementing the agency's core Mars Exploration Program, whose theme is "follow the water." The University of Arizona is the first public university to lead a Mars exploration mission.

Phoenix uses the main body of a lander originally made for a 2001 mission that was cancelled before launch. "During the past year we have run Phoenix through a rigorous testing regimen," said Ed Sedivy, Phoenix spacecraft program manager for Lockheed Martin Space Systems, Denver, which built the spacecraft. "The testing approach runs the spacecraft and integrated instruments through actual mission sequences, allowing us to assess the entire system through the life of the mission while here on Earth."

Samples of soil and ice collected by the lander's robotic arm will be analyzed by instruments mounted on the deck. One key instrument will check for water and carbon-containing compounds by heating soil samples in tiny ovens and examining the vapors that are given off. Another will test soil samples by adding water and analyzing the dissolution products. Cameras and microscopes will provide information on scales spanning 10 powers of 10, from features that could fit by the hundreds into a period at the end of a sentence to the aerial view taken during descent. A weather station will provide information about atmospheric processes in the arctic region.

Lockheed Martin shares operational roles with JPL. International contributions are provided by the Canadian Space Agency; the University of Neuchatel, Switzerland; the universities of Copenhagen and Aarhus, Denmark; the Max Planck Institute, Germany; and the Finnish Meteorological Institute.

For more information on the mission, visit *http://www.nasa.gov/phoenix* or *http://phoenix.lpl.arizona.edu.*

Terrestrial message nears interstellar space

Voyager celebrates 30 years

Former Voyager Project Manager John Casani, left, and Project Scientist Ed Stone.

By Janna Brancolini

A mission that was supposed to last just five years is celebrating its 30th anniversary as JPL scientists continue to receive data from the Voyager 1 and 2 spacecraft during their approach of interstellar space.

"That's what amazes people—at JPL open houses they say, 'You're still tracking them?'" said Steve Howard, the mission's ground data systems engineer who has been with the Voyager team since 1985.

Voyager 2 launched on Aug. 20, 1977, and was the first spacecraft to visit all four of the gas-giant planets: Jupiter, Saturn, Uranus and Neptune. Using gravity assist, it took Voyager 2 only 12 years to visit these planets instead of the normal 30. Although the craft was originally slated to visit just Jupiter and Saturn in a five-year mission, scientists took advantage of a unique planetary alignment that allowed them to re-program Voyager 2's trajectory throughout the mission. It is currently headed to the heliosheath, a shock wave caused by winds radiating outward from the sun.

Voyager 1 launched on Sept. 5, 1977, and is the farthest human-made object from Earth. It was put on a faster path to Jupiter, and it was named Voyager 1 because it arrived at the solar system's largest planet first, despite being launched second, according to former project manager John Casani. Voyager 1 swung by Jupiter and headed to Saturn where it flew behind the inclined rings, sending it upward at 35 degrees above the plane of the planets. It has already entered the heliosheath, and scientists predict it is just a few years away from interstellar space. Once there it will be completely beyond the sun's influence.

"Voyager opens up the future," said Ed Stone, Voyager's project scientist and former JPL director. "It points to a way to journey deep into space. The Voyager spacecraft will be the first human-made objects to reach interstellar space, so that's an important milestone." He added that although Voyager's initial mission was to explore only Jupiter and Saturn, the goal was to continue on to Uranus and Neptune, and eventually reach interstellar space.

Stone explained that the sun has a wind blowing radially outwards at 1 million to 2 million mph. This creates a bubble, which is called the heliosphere, and almost everything in the heliosphere is associated with the sun. Voyager 1 has reached the outermost layer of the heliosphere, and Voyager 2 is nearly there.

Although it has not yet reached interstellar space, Voyager is collecting data that will help scientists measure the size and shape of the heliosphere, which is determined by the pressure of what is outside of it in interstellar space. By measuring its magnetic field, solar wind, energetic ions and low-frequency radio waves, scientists study the heliosphere's shape to learn about what is outside the heliosphere and pressing inward on it.

As the Voyager spacecraft have headed to unexplored regions of space over the past three decades, the mission has garnered the type of public following and professional recognition that most scientists only dream about. Scientists and the public alike followed each discovery, learning about the volcanoes on Jupiter's moon Io, the suggestion of an ocean beneath Europa's icy crust, the complexity of Saturn's ring structure and the possibility of methane rain on Titan.

"It's because of the pictures," Casani said of why the public was so involved in the Voyager fly-bys. "Nobody expected that the moons of Jupiter and Saturn would be anything other than the dull landscape of our own moon. These pictures kept coming back and the moons were all different—colorful, dramatic images."

Stone agreed, noting that although everyone involved in the project knew that Voyager was a journey of discovery, they didn't know how much there was to discover.

"The thing that Voyager really did was give us a new view of the solar system by revealing the complexity and the diversity of the objects in it," he said.

Casani added that the pictures not only revealed new worlds to the public, but allowed them to connect with the discoveries in a way that numerical and other data would not have.

"People can imagine being behind the camera, whereas if it's all data that's coming back … it turns on some scientists, but most people can't connect to it," he said. "You can imagine being in a rocket ship and seeing (what's in those images), and that connection is what makes people interested. People are explorers at heart. This is a way of seeing what had never been seen before, and it made them almost like real-time participants."

The Voyager craft have also become a fixture of pop culture, inspiring novels and playing a central role in television shows, music videos, songs and movies from the 1980s and 1990s. Many of these fictional works focus on what would happen if an alien race were able to locate Earth via Voyager's famous golden records, which include sounds and images of Earth. The selections portray people male and female, young and old—as well as examples of other species—and include information about every continent on the planet, as well as Earth's location in space.

Previous NASA missions included plaques with information about Earth in case an intelligent alien race intercepted the probes. This spurred Casani to appoint astronomer and author Carl Sagan to head a committee to come up with a message for Voyager.

In his book "Murmurs of Earth," Sagan later described how the committee created the record and chose its contents. Physicist Frank Drake suggested the idea of a record that would have pictures on one side and sounds on the other side.

The group had less than six weeks to come up with a record that would represent the entire population of Earth—in addition to the planet itself—if it were ever discovered by an intelligent alien race.

Although the chances of extraterrestrials finding the message are extremely slim, the Voyager golden record has become an icon.

"It's the classic message in a bottle. The likelihood of finding it is small, but the payoff is huge if it is found," said Ann Druyan, a science media producer and author. Druyan was appointed creative director of the record project and later married Sagan.

Stone explained that although there is almost no chance of the record being found, the record is important as a message to ourselves.

"In a sense it's a unifying message," Stone said. "It's a message from Earth. It contains greetings in many languages, music from many cultures and images that portray our home planet. It's our attempt to say what is Earth, and it's a record of who we think we are."

Druyan also explained that the coupling of music and science was an especially compelling reason to devote so much energy to the record.

"The record represented the idea that science and technology could come together with art," said Druyan, who also designed the sound essay. "It's one of the few totally great stories that we have about humans. It cost the taxpayers virtually nothing, nobody got killed. It was a way to celebrate the glory of being alive on this tiny blue dot in 1977.

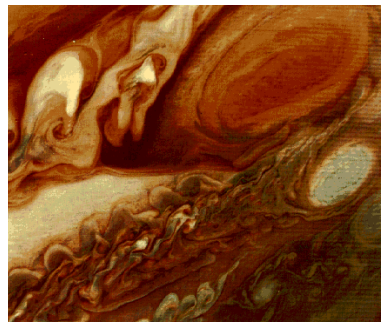
"This was the most romantic and beautiful project ever attempted by NASA," she added. "It had the sounds of a kiss, a mother saying hello to her newborn baby for the first time, all that glorious music. Remember, this was during the Cold War. Everyone was living with the knowledge that 50,000 nuclear weapons could go off at any time, and there was a lot of angst about the future. This was something positive—a way to represent Earth and put our best foot forward. That was irresistible."

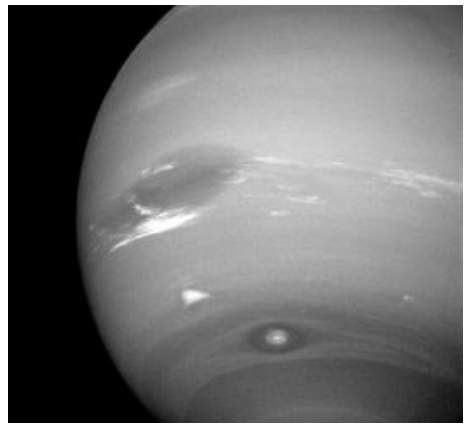
Sagan's son Nick was 6 years old in 1977, when the Voyager records were being assembled. The records feature a recording of him as a child saying, "Hello from the children of planet Earth."

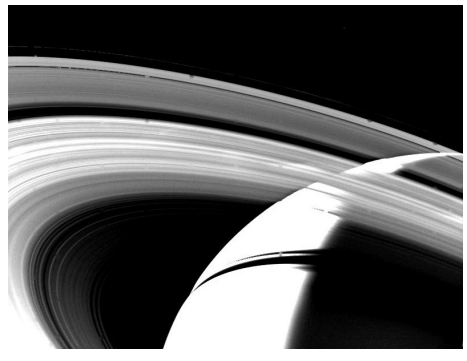
"I had no sense of the magnitude of it at the time," said Nick Sagan, who partially followed in his late father's footsteps by pursuing a career as a science fiction writer. "Literally, it was my parents putting me in front of a microphone and saying, 'What would you say to extraterrestrials?'"

Sagan said he began to realize what the record meant as he got older, and as a teen he started to realize what a "strange but wonderful honor" it was.

"It's been a challenge for the rest of my life to live up to that honor. It's always there in my subconscious," he said. "My dad inspired so many people to do so many







great things—to not take things at face value and to look at evidence to search for the truth. It's something that I look to as a beacon."

Sagan said that he and his father discussed the Voyager discoveries in the context of their search for life. They got excited when the spacecraft photographed Titan and Europa, and Sagan noted a change in his father as the years went by.

"One of the things that surprised him was that we didn't find life during his lifetime," he said. "He started to realize that if there's no other life out there, and life is so rare, we need to protect ours. I saw a shift in him. That's when he started to become more socially and politically conscious."

In the end, Sagan believes that Voyager and other extraterrestrial missions are important because of their process rather than their discoveries.

"The question is: What's it all about?" he said. "If we do find life it will change us, but if not it will change things also. The act of looking will tell us so much, and we will learn so much about ourselves."

Voyager is expected to return data for at least 15 more years.

JPL/Caltech float in the works for Rose Parade

By Mark Whalen

The JPL/Caltech float for the 2008 Tournament of Roses Parade, known as "50 Years of Space Exploration," will be on display at a float test day to be held Saturday, Sept. 15, at Phoenix Decorating Company's Pasadena construction facility.

The event will be held from 6:30 to 8:30 a.m. at the Rose Palace, 835 S. Raymond Ave., between California Boulevard and Glenarm Street. The float test will be held at approximately 7 a.m. Parking will be available on neighboring streets. Coffee and doughnuts will be served.

Tickets to the event are available at the JPL Store through Monday, Sept. 10.

The 2008 float—standing 25 feet high, 18 feet wide and 55 feet long—features Explorer 1 as its centerpiece. On one of the solar panels of the spacecraft nearest Explorer is displayed a floral photographic representation of William Pickering, James van Allen and Wernher von Braun, whose vision ignited the spark for that mission, America's first satellite, which launched in 1958. Each of the planets visited by JPL spacecraft are included on the float. Also featured will be a future mission, Mars Science Laboratory, a rover that will be launched in 2009.

The new float marks the second time in four years that JPL and Caltech will jointly sponsor a Rose Parade float. Phoenix also constructed the 2005 JPL/Caltech entry, "Family of Explorers."

For more information on the float builder, visit *http://www.phxdeco.com.*

News Briefs

Richard Brace

Brace is new chief engineer

Richard Brace has been named JPL's new chief engineer.

Brace joined JPL in 1974 as the Viking radio frequency subsystem test team leader and since then has held positions of increased responsibility in both engineering and management. He has served as technical group supervisor for the Flight Telecommunications Hardware Group, manager of the Electronic Parts Engineering Section, mission assurance manager on Cassini, deputy manager of the Mars Exploration Rover Project, and manager of the Mission Assurance Division. Most recently, he was the chief project assurance manager for the Office of Safety and Mission Success.

Brace has been awarded an Exceptional Service medal for his work on Galileo and Outstanding Leadership medals for his work on Cassini and the Mars Exploration Rover Project.

Dawn targets Sept. 26

The launch of JPL's Dawn mission to the asteroid belt has been rescheduled for a launch period of Sept. 26 through Oct. 15.

NASA established the launch period the week of Aug. 20. Computer files that will be used during the final countdown were tested on the spacecraft, demonstrating that they work correctly.

Two JPLers join astronautics academy

Leon Alkalai of the Robotic Lunar Exploration Office and Gregg Vane of the Solar System Mission Formulation Program Office have recently been named members of the International Academy of Astronautics.

The organization's goals are to foster the development of astronautics for peaceful purposes; recognize individuals who have distinguished themselves in a related branch of science or technology; provide a program through which members may contribute to international endeavors; and encourage cooperation in the advancement of aerospace science.

The academy was founded in 1960 by former JPL Director Theodore von Kármán. The current president is former JPL Director Ed Stone.

Childcare openings for fall

The JPL/Caltech Child Educational Center is now enrolling for the 2007–2008 year and has immediate full- and part-time openings in its preschool program for 4-year-old children.

The new program year begins Sept. 10. For more information, please contact Helen Ruppel at *hruppel@caltech.edu* or ext. 4-3418, or visit *ceconline.org*.

Rep. Ken Calvert (left) joins Linda and Larry Bryant at Rubidoux post office ceremonies.

Army officer honored

The post office in the community of Rubidoux, Calif., has been renamed in memory of an American soldier who is the son of a current and former JPL employee.

Dedication ceremonies at the facility in the city of Riverside honored U.S. Army Lt. Todd Bryant, who lost his life in Iraq in October 2003 at age 23. Bryant's mother, Linda, is a retired JPLer and his father, Larry, works in the System Verification and Validation Engineering Group.

Besides Bryant's parents, his widow, Jenifer, also attended the July post office dedication.

JPL paid tribute to Bryant's memory by dedicating a plaque and American flag in Building 230 shortly after the Jan. 24, 2004 landing of the Mars Opportunity rover.

U.S. Rep. Ken Calvert (R-Corona), who nominated Bryant to the U.S. Military Academy at West Point, N.Y., introduced a bill earlier this year to have the post office renamed in the officer's memory. President Bush signed the bill into law in the spring.

Passings

Nicholas Jansen, 85, a retired administrative group supervisor in Section 6459, died June 2.

Jansen worked at JPL from 1968 to 1988.

Millicent Osoff, 82, a retired senior department assistant in Section 6131, died June 17.

She worked at the Lab from 1982 to 1996.

Mary O'Connor, 71, a retired office specialist in the Supplier Payment Section 2143, died June 22.

O'Connor joined JPL in 1988 and retired in 1999. She is survived by her brother Maurice and niece Kelly Pendleton.

Private services were held in Milford, N.H. Those wishing to contact the family may e-mail *Kelly_Pendleton@yahoo.com*.

Lloyd Day, 78, a retired manager in Section 1200, died July 25.

Day worked at JPL from 1968 to 1991. His last assignment with JPL was in Reston, Va., working on the first human-occupied space station.

He is survived by his wife, Lila, three daughters, 10 grandchildren and 16 great grandchildren.

Letters

To the JPL community and my New Millennium Program family, please accept my appreciation and thanks for your kindness, expressions of concern and living plants following the recent passing of my mother. She was a great fan of JPL and all of you who labored in fulfilling her view into the universe, a celestial part of which she now dwells in.

David T. Spencer

I would like to extend my heartfelt thanks to everyone at JPL who has provided so much support and kindness over the passing of my husband, Mark Gutheinz. The flowers, plants and the contributions to the memorial fund were much appreciated. My daughter, Stephanie Wong, sister, Weni Wilson, and I have been comforted by all who expressed their kind sympathies and condolences during this difficult time. We are grateful to all who attended the visitation and the funeral, and we are proud to be part of the JPL family.

Sandy Gutheinz and family

My family and I would like to thank JPL for the beautiful orchid plant and my JPL family of friends and coworkers, especially in Division 31, for their generosity, prayers, flowers and numerous kind expressions of sympathy on the recent passing of my husband, Richard. I would also like to thank everyone who attended the church services. The support and caring demonstrated by your attendance is sincerely appreciated and will always be remembered.

Lourdes McKim

I want to express sincere thanks to my friends and colleagues at JPL for the many expressions of condolence given to me and my family following the death of my mother. She loved to garden and the beautiful orchid plant we received from JPL is a perfect reminder of her. Your kindness is a great comfort at a very difficult time.

Cathleen Jones

No one prepares for a loss and there is no way to prepare for a sudden loss of a loved one. It is with the support of the others that we pick the pieces and rebuild our lives and continue. On behalf of myself, my sons Hootan, Hoormazd and our family, I would like to extend my heartfelt gratitude and sincere appreciation for the outpouring of love and support that was forwarded to us, following the unexpected passing of my wife of 30 years, Farah. Your cards, e-mails, phone calls, flowers and presence at the funeral, burial and memorial services overwhelmed all of us. We are very lucky to have friends like you. Thank you.

Tooraj Kia

My family and I would like to express our sincere gratitude for all of the support during the recent passing of my grandmother. All of the prayers, warm thoughts and the beautiful JPL plant were deeply appreciated. Many thanks again,

Colleen Schroeder

Retirees

The following JPL employees retired in September:

Gary Stevens, 40 years, Section 332; **Thomas Thorpe**, 38 years, Section 660; **Jerry Clark**, 32 years, Section 386; **Roger Crowe**, 28 years, Section 173B; **Barbara Vaughn**, 27 years, Section 8031; **Donna Bean**, 22 years, Section 332E; **Ralph Kahn**, 21 years, Section 237; **Irene Camara**, 10 years, Section 2661.

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