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Mission update

The launch of the STS-99 mission was scheduled at press time for Feb. 11 at 12:30 p.m.

The six-person crew of the Shuttle Radar Topography Mission arrived at KSC on Feb. 7, and the countdown was scheduled to commence on Feb. 8.

Given an on-time launch, landing will occur on Feb. 22 at 4:38 p.m. at KSC's Shuttle Landing Facility.

The crew aboard the Space Shuttle Endeavour will spend most of the 11-day mission taking measurements of the Earth's surface.

It will be the 14th flight of Endeavour and 97th Space Shuttle launch.

Shuttle News, Page 3

Water cleanup gains attention

Complex 34 effort compares methods

Cold northwest winds blowing across Complex 34, Cape Canaveral Air Station, on Jan. 25 and 26 didn't deter the several hundred participants listening to experts describe their groundwater cleanup methods at the site.

The Interagency DNAPL Consortium (IDC) sponsored Technical Visitor's Day, an environmental conference held at the Early Space Education Conference Center (ESECC), KSC Visitor Complex. KSC and IDC hosted representatives from businesses, state and federal agencies to share the results to date of three remediation source removal techniques for trichloroethylene (TCE) solvent. Concentrations of the solvent have been identified in the soil at Complex 34 as a result of cleaning methods for rocket parts during the Apollo Program, which used the site in the 1960s.

On top of the block house at Launch Complex 34, Laymon Gray of Florida State University tells representatives from environmental and federal agencies about the environmental research project that involves the Department of Defense, Environmental Protection Agency, Department of Energy and NASA in a groundwater cleanup effort.

The comparison of the three techniques has been termed the remediation "bakeoff" because two of the methods involve heating the soil and "boiling" the contaminant, transforming it into a gas; and the third method adds a separate ingredient into the mix. The first two are Six Phase Heating and Steam Injection. The third method is In-Situ Chemical Oxidation with Permanganate.

The benefits of the three technologies are that they tackle and conquer the source of contamina-

(See Cleanup, Page 2)

Ed Markowski, center, gets to know Kevin Castine, right, and his son, Brandon, during the KSC bone marrow drive kick-off. Markowski, a training coordinator in the Shuttle Processing Directorate, donated marrow that was transplanted into Kevin Castine, a leukemia patient from New York.

Meeting with recipient thrills marrow donor

In November 1997, Ed Markowski sat in a room inside the NASA Training Auditorium as a needle drew a small sample of blood from his arm.

Two weeks ago, Markowski stood on the stage of the Training Auditorium and saw the ultimate result of that original, seemingly modest moment. A stocky man who seemed unaccustomed to the tie he was wearing walked onto the stage and toward Markowski. Kevin Castine offered his hand, but Markowski responded with an embrace that lasted a minute.

Castine, a railroad worker from Champlain, N.Y., had been dangerously ill with chronic myelogenous leukemia when Markowski first gave blood to determine whether he might become a bone marrow donor. More than two years later, following his receipt of marrow from Markowski, Castine appeared no less healthy than the man sharing the stage with him.

Before the meeting, Markowski

(See Marrow, Page 6)

Reading all about it

JoAnn Morgan, associate director for Advanced Development and Shuttle Upgrades , studies newspaper front pages chronicling space-related events in the mobile exhibition called "NewsCapade with Al Neuharth." The exhibit showing at the KSC Visitor Complex started its cross-country tour in San Francisco in April. It is a traveling version of the Newseum, a media history museum in Arlington, Va. Morgan was among four speakers discussing "Space, the Media and the Millennium" at a reception Jan. 24 kicking off the display at KSC.

Skin cancer kick-off event re-scheduled

The kick-off event for the Skin Cancer Prevention Program originally scheduled for Feb. 11 was postponed to avoid a conflict with launch activities. The event has been re-scheduled for Feb. 24 at 11 a.m. in the Mission Briefing Room.

The skin cancer campaign is one health element in NASA's Agency Safety Initiative. The program focuses on proven techniques for reducing risks, early detection and health education about skin cancer.

The kick-off event is scheduled to include a guest appearance by astronaut Jeffrey Ashby. Representatives from the Florida Chapter of the American Cancer Society and the American Academy of Dermatology also will be present to answer questions about skin protection.

All employees will be welcome to the kick-off event to receive information about protection against skin cancer.

For more information about the Skin Cancer Prevention Program, please contact Dr. Dave Tipton at 867-6385.

Cleanup ...

(Continued from Page 1)

tion at the site. They also offer a way to remove the solvent in months instead of decades.

The Open House comprised talks about the three technologies at the ESECC, followed by a bus trip to Complex 34 where experts showed some of their equipment and their methods plus answered questions from the participants.

"To see the results of people who are doing real world technology, listen to them, compare notes and discuss what works and what doesn't makes the job of designing my next project much easier," commented Robert Cowdery, senior engineer with the environmental consulting firm Levine Fricke LFR, who attended the open house. "It is rare enough to corner one person who has the knowledge and inclination to talk about it, but to see three persons at one time provided hard core usable information. I could have spent a full day with each of the presenters. I would love to see (a presentation) like this on an annual basis."

Groundwater cleanup technologies under review

• Six Phase Heating technology uses thermal remediation in the form of an electrical current to heat the groundwater and contaminant, the TCE solvent. Once heated, the TCE transforms into a gas and rises to the land's surface where it is sucked by a vacuum process and sent to an above-ground vapor treatment system.

• Steam Injection technology also uses thermal remediation, but the steam is created on the surface and then piped into the groundwater. This technology also allows oxygen to be piped into the groundwater, helping to break down any remaining contaminant that wasn't transformed into a gas. The gas must then be treated above-ground.

• The third method pumps potassium permanganate into the groundwater (above photo). The permanganate is an oxidant, and it reacts with the TCE to chemically break it down into harmless byproducts. There is no heat involved; the chemical reaction occurs spontaneously. Ground water is not pumped out of the aquifer — the permanganate will turn the water purple, which indicates it is working, and eventually will disappear.

Planners ready for split ISS flights

NASA managers are giving themselves multiple options for International Space Station flights.

In order to preserve an option to fly an additional Space Shuttle mission this year to perform maintenance on the International Space Station, Shuttle and Station managers have decided to plan a formal revision to the content of Shuttle mission STS-101.

The planning will allow the orbiter Atlantis to visit the Station in April if needed, ahead of the arrival of the Russian Zvezda service module, to perform maintenance.

However, managers could decide as late as March to return to the original planned content for STS-101 and eliminate the added mission. Such a move would depend on the launch date selected for the Russian Zvezda service module by the Station program.

The option including a Space Station maintenance flight would distribute the original content of STS-101 between two Shuttle missions. The first mission, now targeted for launch no earlier than April 13 aboard Atlantis, will retain the STS-101 designation but be a 10-day-long flight to perform maintenance on the International Space Station's Zarya and Unity modules.

The second mission, which would be designated STS-106 and which remains under review by managers, would be a Zvezda module outfitting mission that would dock with the Station about one month after Zvezda's launch.

Whether or not STS-106 will be required and any necessary adjustments to the target launch dates for subsequent Shuttle flights will be dependent on the launch date scheduled for Zvezda.

A launch date for Zvezda is expected to be selected following an International Space Station Joint Program Review. The composition of crews for a revised STS-101 and STS-106 is under review.

Workers in a quality trailer in the Launch Pad 39B Area unwrap a new Enhanced Main Events Controller (E-MEC) to be installed in the Shuttle Endeavour. The original E-MEC in Endeavour became suspect during the Jan. 31 launch countdown and mission STS-99 was delayed when NASA managers decided to replace it.

Replaced part puts STS-99 back on track

The crew of STS-99 will be well prepared when it commences its mission. Having waited since the fall for a launch, the crew endured another delay as the result of weather and mechanical problems.

At press time, the Shuttle Radar Topography Mission was scheduled to launch on Feb. 11 at 12:30 p.m. Landing was set for Feb. 22 at Kennedy Space Center.

The mission's scheduled launch on Jan. 31 was scrubbed because of uncooperative weather, including low clouds, rain and the potential for rocket-triggered lightning. The Mission Management Team called off the attempt during the launch window and began preparing the Shuttle Endeavour for a 24-hour turnaround.

At the time of the called scrub, managers and Shuttle engineers were also discussing a problem with the second of two enhanced master events controllers (E-MECs) on Endeavour. The E-MECs control the orbiter's pyrotechnic devices and process the signals that separate the Solid Rocket Boosters and the External Tank.

During the launch countdown, the No. 2 E-MEC that is located in the orbiter's aft engine compartment, failed a standard test procedure just prior to entering the T-20 minute hold. Managers opted to extend the hold at T-20 minutes to allow engineers an opportunity to evaluate the health of the E-MEC. The countdown resumed and went to the planned hold at T-9 minutes before managers called off the attempt.

Subsequent investigation convinced managers that it was necessary to replace the E-MEC. The unit is approximately 20 inches long, 13 inches wide and 8 inches tall and weighs 65 pounds.

The replacement of the E-MEC at Launch Pad 39A required that cryogenic reactants be offloaded from the orbiter and Space Shuttle ordnance disconnected. That work took place Feb. 2 and was followed by installation and retest efforts. Workers then reconnected Shuttle ordnance and completed aft compartment close-outs.

After flying back to Johnson Space Center, the crew returned to KSC on Feb. 7.

STS-99 will make the most extensive three-dimensional measurements of the Earth's surface ever undertaken. The resulting data will be used for a variety of purposes, both military and civilian.

The crew consists of Commander Kevin Kregel, Pilot Dominic Gorie and Mission Specialists Janet Kavandi, Janice Voss, Mamoru Mohri and Gerhard P.J. Thiele. Mohri represents NASDA, the Japanese space organization, and Thiele represents the European Space Agency.

Space spinoff is in fabric of his life

NASA-designed suit gives Pa. boy freedom

On a crowded day at the KSC Visitor Complex, tourists happily gathered around a worker wearing a replica of an astronaut's white spacewalk suit. They posed for pictures beside the figure in the white outfit with the shiny, gold helmet visor.

A few feet away, a much smaller figure ambled through the complex in an outfit that was less conspicuous but still unusual — a light-gray body suit, including gloves and a full-face hood that attached to darkly tinted goggles. For the moment, 10-year-old Jonathan Pierce drew no attention as he walked along with family members. But he was prepared for anything.

The suit blocks 99.9 percent of ultraviolet rays.

"My dad said maybe they'll mistake me for an astronaut," Jonathan said.

He isn't an astronaut, but Jonathan does have a direct connection to the space program. The suit he wore was designed by NASA engineers at Johnson Space Center, and it wouldn't have been possible for him to stroll the Visitor Complex without it. The Pennsylvania boy has a condition called erythropoietic protoporphyria (EPP), a rare, inherited metabolic disorder that causes his skin to be excessively sensitive to sunlight, as well as some types of artificial light.

He received the protective suit in December 1998, with the $2,500 cost covered by Kiwanis Club International. The Christmas gift, one of about 30 in the country, was tailored for him with room for three inches of growth.

The suit, made from a synthetic, nylon-like fabric called Solar Weave, blocks 99.9 percent of ultraviolet (UV) rays — making it UV-proof in combination with the clothes worn under it. The parts are manufactured at various places and assembled by the HED Foundation, a Virginia organization formed to help children with hypohidrotic ectodermal dysplasia (HED), an ailment that prevents the body from sweating. The suit includes a cooling vest that Jonathan wears in hot conditions.

The vest wasn't necessary on the chilly day Jonathan visited KSC. The Make-A-Wish Foundation sponsored the trip for the Pierce family (Jonathan's grandparents joined at their own expense), combining a day at Disney World with the stop at KSC. The family was taken to the Banana Creek Viewing Area to watch the planned launch of STS-99, but a weather scrub prevented Jonathan from that anticipated sight.

The day, however, was hardly a loss, as Jonathan toured the Saturn V Center and other exhibits. Earlier, Jonathan met NASA Administrator Dan Goldin and astronaut Doug Wheelock at the IMAX Theater. After giving gift bags to Jonathan and his older sister, Jaimie, Goldin chatted with the boy.

Jonathan Pierce, 10 meets with astronaut Doug Wheelock, above, and NASA Administrator Dan Goldin and his wife, Judy, during a visit to KSC on Jan. 31. At right, the Pennsylvania boy wears the full protective suit designed by NASA that shields his skin from ultraviolet rays.

"You know what, Jonathan, when we build the International Space Station, we're going to make even better fabrics and make your suit even more comfortable," Goldin said.

"It's comfortable enough already," Jonathan replied.

He added that his suit offers certain advantages — such as the ability to stick out his tongue at people without their knowing. As Goldin posed with Jonathan for a family photo, he said: "Now, don't you stick out your tongue."

Penny Pierce, Jonathan's mother, admits that the family used to pay little attention to the space program, despite the fact that her cousin, Gary Sulick, works for Boeing at KSC. But that all changed when Jonathan began wearing what he calls "my NASA suit."

(See Suit, Page 5)

African-American culture on display

KSC officially opened its observance of African-American History Month with a ceremony on Feb. 3 in the NASA Training Auditorium.

The event included a performance by the Bethune-Cookman College steel band, wearing traditional African clothing.

The tradition of celebrating African-American history originated in 1926, when Dr. Carter G. Woodson, a Harvard-trained scholar, international educator and son of a former slave, established "Negro History Week." The date of February 19 coincided with the birthdays of Abraham Lincoln and Frederick Douglass, two pivotal figures in African-American history.

Dr. Woodson believed that the study and publication or spreading of African and African-American history would encourage racial harmony. In 1976, president Gerald Ford established the month-long celebration as part of the bicentennial commemoration.

KSC celebrates diversity with several regular observances, including: Women's History Month (March), Asian and Pacific American Heritage Month (May), National Hispanic Heritage Month (September 15-October 15), National Disability Employment Month (October), Native American Heritage Month (November) and the KSC All-American Picnic (spring).

The highlight of KSC's observance will be a luncheon held on Feb. 16 in the Visitor Complex's Early Space Exploration Center. Dr. Julian Earls, deputy director for operations at Glenn Research Center, is the speaker.

KSC's commitment to diversity also is reflected in the workforce. Among the civil service population, 20.8 percent of employees are minorities.

Michelle Amos of the Engineering Development directorate, above, mistress of ceremonies for the kick-off of African-American History Month, teaches the audience to pronounce words in Swahili during the event at the NASA Training Auditorium. At right, Mack McKinney, chief of program resources management and chairperson for African-American History Month, presents a plaque to Bhetty Waldron. She was honored for her charcoal portraits of educator Dr. Mary McLeod Bethune and writer Zora Neale Hurston during the ceremony. The theme of this year's observance is "Heritage and Horizons: The African-American Legacy and the Challenges of the 21st Century."

Suit ...

(Continued from Page 4)

Before getting the suit, Jonathan faced restrictions that made outdoor activity between sunrise and sunset virtually impossible. While his sister enjoyed the family's backyard pool in Rossiter, Pa., Jonathan had to wait until dusk to swim. While classmates headed outside for gym class, he stayed inside, playing volleyball or other games with a teacher in a small room and often breaking things as a result.

The family had to cover the car windows with blankets whenever traveling with Jonathan. On top of that, he took high doses of beta carotene (which can cause liver damage) and used industrial-strength sunscreen. When Jonathan chafed against all those precautions, his mother had only to point out the permanent scars on his hands, reminders of earlier severe sunburns.

Now, he can do nearly anything outside during daylight except swim. Indoors or in uncertain conditions, a set of beads on his necklace indicate UV levels by changing from opaque white (a safe level) through a range of colors.

"(The suit) makes my life better by making me get out and get a lot more exercise," Jonathan said. "I'm a lot stronger now. I can beat my cousin in racing (on foot) now. And I can go to gym class."

In a combination of gratitude and genuine interest, Jonathan now has the walls of his room covered with space posters. Glowing stars adorn the ceiling — one form of light that poses no harm to him. The fifth-grader also rattles off facts about the Space Shuttle in his light but authoritative voice.

He considers the attention and curiosity that his suit provokes to be a small price to pay for the freedom it has brought him. He seemed unaffected by the TV cameras and microphones surrounding him during and after his meeting with Goldin.

"At school, everybody gets used to (the suit), except for the kindergartners," Jonathan said. "Other places, we don't have to worry about kids. But the adults, they go like —" He dropped his jaw, opened his mouth widely and pointed.

"Kids just think I'm a cartoon character," he continued. "When we were at Disney, one kid said, 'Hey, I need his autograph!' "

Despite his EPP condition and other ailments that forced heart surgery at age 2 and several foot operations, Jonathan carries the air of an average kid, without a hint of bitterness. For him, the suit is a blessing rather than a burden.

"This past summer, we relived Jonathan's whole child-life," Penny Pierce said. "We went to the zoo because Jonathan had never been to a zoo. We went to see the Statue of Liberty. ... It's like (the suit) has given him his childhood back."

Proposed NASA budget shows slight increase

NASA Administrator Dan Goldin announced on Feb. 7 that the Clinton Administration's proposed budget for Fiscal Year 2001 shows the first spending increase for NASA in seven years.

The proposed budget includes a total figure of $14. 035 billion for NASA — an increase of approximately $435 million over the Fiscal Year (FY) 2000 total.

The budget includes funding for increases in the workforce at KSC, as well as other NASA centers. The agency as a whole shows an increase in total, full-time, permanent workyears from 18,413 in 2000 to 18,741 in 2001.

"We saw in the human spaceflight centers, particularly Kennedy, Johnson and Marshall, that we needed to increase our workforce and strengthen and revitalize it," Goldin said. "We've already started to increase the workforce at Kennedy, and we will continue to increase the workforce."

The budget also mentions several specific projects at KSC for which spending is proposed, notably the construction of a new Operations Support Building.

The repair of the Payload Changeout Room at Launch Pad 39B, resoration of pad surfaces and slopes at Pad 39B, refurbishment of elevator controls in the Vehicle Assembly Building and other facility improvements also were proposed.

Marrow ...

(Continued from Page 1)

and Castine had not even seen pictures of each other, although they had talked on the phone a few times.

"My heart bursts with joy to see Kevin here, looking so robust and so well," said Markowski, a training coordinator in the Shuttle Processing directorate. "It's certainly a high privilege and honor to be able to literally pour your life into someone else. Kevin and I are blood brothers now."

Castine, 43, was too overwhelmed to speak during the presentation, instead letting his wife, Penny, express their shared gratitude. Accompanied by his teenage son, Brandon, and other relatives and friends, Castine presented a jug of maple syrup to Markowski, himself a native of upstate New York. In turn, KSC Director Roy Bridges and Deputy Director for Business Operations James Jennings gave Castine several mementos, including a large, framed photo of a Space Shuttle launch.

"It's pretty emotional," Castine said afterward. "What can you say to a guy who saved your life? If it weren't for this marrow from Ed, I might be six feet under right now."

The scene added considerable poignancy to the kickoff for the third bone marrow donor campaign at KSC. The registration drive, sponsored by KSC civil servants and contractors and the American Red Cross, takes place Feb. 15-18 at KSC as well as at Cape Canaveral Air Station and the United Space Alliance (USA) Health and Wellness Center in Cape Canaveral.

Those who give blood samples during the drive will have their marrow types determined and entered into a national registry, with the possibility of giving a marrow donation if a compatible recipient is found.

Those who give blood samples during the drive will have their marrow types determined and entered into a natonal registry, with the possibility of giving a marrow donation if a compatible recipient is found.

Markowski noted that when KSC held its first marrow drive in 1996, he saw a memo about it but didn't participate. The next fall, he responded to the strong encouragement of his supervisor, Steve Chance, and became one of about 1,500 KSC employees who have joined the national marrow donor registry.

Eight months later, a Red Cross representative called Markowski asking for additional blood samples — a preliminary match had been found. Further tests showed that Markowski shared marrow characteristics with a leukemia patient who had been unable to find a match for a year and a half.

On Jan. 22, 1999, Markowski underwent a marrow "harvesting" procedure at the Mayo Clinic in Jacksonville. While he was under general anesthesia, doctors used a special syringe to extract the marrow from his pelvic bone.

Markowski said the procedure was painless but that there was minor discomfort afterward. He was able to return to work within days.

Meanwhile, Jennifer Murray of the Engineering Development Directorate and a coordinator of the KSC marrow program, flew to Boston with the marrow specimen .

KSC Director Roy Bridges presents a hat and a Space Shuttle photo to Kevin Castine as marrow donor Ed Markowski, right, and Castine's father look on. Kevin Castine received his marrow transplant on Jan. 22, 1999.

She delivered the marrow to the hospital where Castine awaited the transplant and met his family. Because of Red Cross guidelines requiring confidentiality for one year following a donation, Murray had to deflect relatives' questions about the donor.

That responsibility was sorely tested in the following year, during which Markowski and Castine exchanged letters devoid of any identifying information.

"Ed was always trying to trick me into telling him more about Kevin," Murray said, clearly relieved that the year of forced secrecy had ended a few days earlier.

Castine, who had been on full chemotherapy before the transplant, made a gradual recovery. He said it wasn't until last September that his energy began to return.

"Right now I'm in pretty good shape," Castine said. "All my blood counts are normal. I want to go back to work in March."

Even amid the happiness of his meeting with his recipient, Markowski remained mindful that the need for marrow never ends. As Murray pointed out, two KSC employees have family members with diseases that may make future marrow transplants necessary.

Dr. John Cinco of the NASA Biomedical Office and a coordinator of the KSC marrow program emphasized the need for minority donors. Only 30 percent of those who need transplants can find a match among relatives, and an outside genetic match is most likely within the same racial or ethnic group. However, the number of minority potential donors on the national registry is extremely low. Without more minority marrow donors, the chances for saving the lives of minority patients remain slim.

During his remarks at the ceremony, Bridges called Markowski "my hero." But Markowski insisted that virtually anyone could fulfill the same role.

"I'm just a regular NASA employee," Markowski said. "I'm no different from anybody else."

KSC takes venerable pilot under its wing

Astronaut Andy Thomas greets 100-year-old Ralph Charles at the STS-99 launch attempt on Jan. 31.

While Dom Gorie took his position as pilot of Space Shuttle Endeavour for a planned launch on Jan. 31, there was a slightly older pilot in attendance at KSC.

Ralph Charles, the oldest licensed pilot in the United States at age 100, was one of the VIPs at the Banana Creek viewing area for that day's launch attempt. Weather forced a postponement of the STS-99 launch until Feb. 11.

Charles is one of the few remaining links to the origins of aviation. Born in Middletown, Ohio, on Nov. 8, 1899, he took flying lessons from Bernard Whelan, one of the first fliers trained by Orville Wright. He also served as a welder at Rinehart-Whelan Aviation School in Dayton, Ohio, repairing and maintaining the first generation of airplanes.

During the early 1920s, when steel-bodied planes began replacing wooden planes, Charles worked for Consolidated Aircraft at Wright Field as a steel repair expert. To make extra money, he made use of his flying skill as a barnstormer, traveling to towns in which people had never seen airplanes. He gave the townsfolk five-minute plane rides for $3 each.

Charles worked at building airplanes during the 1930s and then began flying chartered planes based at the Standard Oil hangar in Newark, N.J., the same hangar in which famed aviator Charles Lindbergh kept his plane.

Charles and a partner moved their families in 1940 to Puerto Rico, where they operated a charter service between various locations in the Caribbean. Three years later, Charles and his wife, Leona, returned to Ohio, where he worked for the Curtiss Wright Airplane Company as a civilian test pilot.

He stopped flying in the mid-1940s, honoring the request of his wife, who had grown tired of their frequent moves. Settling in Columbus, Ohio, Charles ran an automotive repair shop until retiring in 1965, when he and his wife moved to a more rural spot in Ohio.

For 30 years, Charles respected his wife's wishes and didn't fly. Following her death in 1995, after 70 years of marriage, he bought a World War II-era plane called a Defender and regained his pilot's license. Despite his long hiatus from aviation, he carries more than 6,000 hours of flight time. That experience includes a couple of crashes.

Charles said he watches all the Space Shuttle launches on TV in Ohio. NASA has made it clear he is welcome to return for the rescheduled launch of STS-99 if his schedule allows it.

February employees of the month

February employees of the month are, standing from left, James Suderman, Expendable Launch Vehicles and Payload Carriers; James Belote, Installation Operations; Glenn Seaton, Checkout and Launch Control System Office; Art Beller, Office of Chief Information Officer; and Janice Robertson, Office of Chief Financial Officer; seated from left, Tom Marren, Shuttle Processing; Rosaly Santos-Ebaugh, Biomedical Office; Thomas Eichenhart, Safety and Mission Assurance; and Carol Dunn, Engineering Development. Not pictured are Jose Alonso, Logistic Operations; Patty Hepburn, Space Shuttle Program Launch Integration; Robert Kuczajda, Space Station and Shuttle Payloads; and David Culp, Procurement Office.

Foundation enhances its tribute to fallen astronauts

The Astronauts Memorial Foundation held a dedication ceremony on Feb. 7 for an addition to one of the most visible elements at the Visitor Complex.

The ceremony brought attention to the recently completed Wall of Deceased Astronauts, an enhancement to the 43-foot tall, 50-foot wide Space Mirror memorial. Located adjacent to the Space Mirror, the 6-foot-by-6-foot granite wall features laser-engraved portraits and biographical descriptions of the 17 astronauts who have died during missions or while in training.

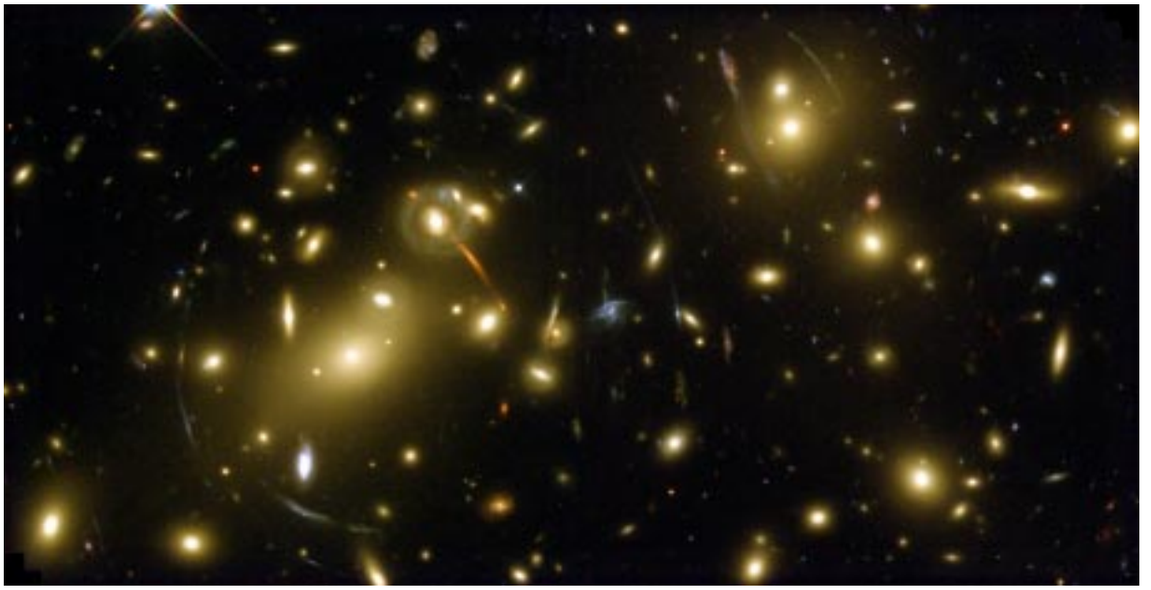
"The original wall, though magnificent, doesn't give background information on the astronauts," said Steve Feldman, chief executive officer of the Astronauts Memorial Foundation, a not-for-profit organization based at KSC. "For the tourists coming in, we thought it would be more meaningful to have that information."

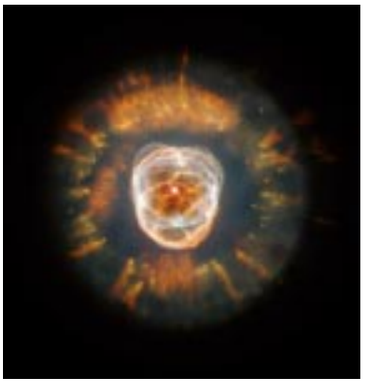
Feldman said the wall descriptions include college and military histories, names of relatives, and information about missions flown and the accidents that claimed each astronaut. The 17 honored include the crews of Apollo 1 and the Space Shuttle Challenger, as well as seven others.

Since its unveiling in May 1991, the Space Mirror has honored the fallen astronauts in simple fashion. Their names are engraved through the granite, and when struck at the correct angle by the sun's rays, are emblazoned on the granite surface as if projected into the heavens.

The Astronauts Memorial Foundation, a not-for-profit organization, was founded after the Challenger accident in January 1986. In addition to its role with the Space Mirror, the AMF maintains the Center for Space Education, a 44,000-square-foot facility that provides education and technology training for educators.

Repaired Hubble captures marvels





Scanning the heavens for the first time since the successful STS-103 servicing mission, NASA's Hubble Space Telescope has imaged a giant, cosmic magnifying glass, a massive cluster of galaxies called Abell 2218, pictured above. This cluster resides in the constellation Draco, some 2 billion light-years from Earth. At right, another new Hubble image shows a planetary nebula, the glowing remains of a dying, sun-like star. This stellar relic is nicknamed the "Eskimo" Nebula (NGC 2392) because, when viewed through ground-based telescopes, it resembles a face surrounded by a fur parka.

NASA's Hubble Space Telescope is back in business, as made dramatically evident in stunning new celestial pictures of remote galaxies and a colorful dying star.

The images were taken during mid-January as part of the activities to recommission the Earth-orbiting telescope.

The pictures are a culmination of the successful Space Shuttle servicing mission STS-103, which launched from and landed at KSC last December. The mission restored NASA's premier optical space observatory to full capability, beefed up with new electronics and critically needed replacement gyroscopes. Hubble has now resumed probing the universe's many mysteries with a crystal-clear view.

"Thanks to the great work by the astronauts, Hubble is better than new," said Dr. Ed Weiler, NASA associate administrator for Space Science. "I think there is no better proof than these pictures that NASA's capability to send humans into space to work on Hubble has had a vital role in space science and the renaissance in astronomy we're now seeing."

"After a two-month hiatus, it is a tremendous boost to all of astronomy to see Hubble back in action. NASA has restored the observatory to a condition that was better than it was even before the fourth gyroscope failed," said Steven Beckwith, director of the Space Telescope Science Institute, the Hubble Science Operations Center in Baltimore, Md.

To verify the telescope's refurbishment, astronomers resumed operations by aiming it at two scientifically intriguing and photogenic celestial targets. One object is an intricate structure of shells and streamers of gas around a dying sun-like star 5,000 light-years away.

Designated NGC 2392, it is dubbed the "Eskimo Nebula" because, as seen through ground-based telescopes, it resembles a face inside a furry parka. In Hubble's sharp view, the "furry" features resemble giant comets all pointing away from the central star, like the spokes of a wheel.

"The clumps that form the comet heads all seem to be located at a similar distance from the star. This fact will be important in developing a theory of why the clumps formed in the first place," said planetary nebula expert J. Patrick Harrington of the University of Maryland, College Park. He adds, "Of all the planetary nebulae imaged by the Hubble Space Telescope, this new image is unsurpassed in subtle beauty."

A second target is a massive cluster of galaxies called Abell 2218, which acts like a giant zoom lens in space. The gravitational field of the cluster magnifies the light of more distant galaxies far behind it, providing a deep probe of the very distant universe. The cluster was imaged in full color, providing astronomers with a spectacular and unique new view of the early universe.

"For the first time we can view the internal color structure of some very distant galaxies. This gives us new insight into details of what young galaxies are like," says Professor Richard Ellis at the California Institute of Technology, Pasadena, and a co-investigator on the original (black-and-white) Hubble image of Abell 2218 taken in 1994.

"The color of a distant source is preserved by gravitational lensing. By matching images of the same color, families of multiple images produced by the lensing process can be identified."

Andrew Fruchter, leader of the team who took the early release observations is particularly fascinated by an unusual red feature in the field. "This extraordinary object has colors which indicate it is one of two things, either a rare, extremely cool dwarf star in our own galaxy, or one of the most distant objects ever viewed by Hubble lensed into visibility by the mass of the cluster," says Fruchter.

Further observations will be needed to confirm the identity of this unusual object.

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