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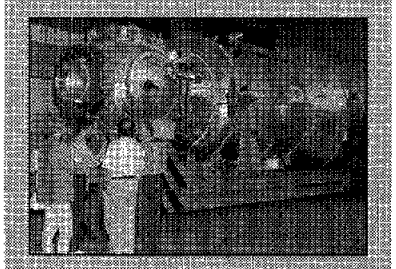

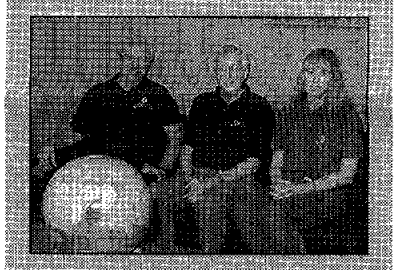

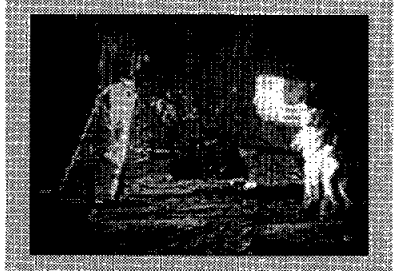

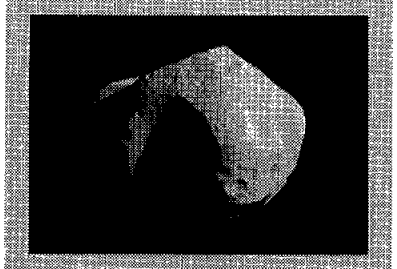

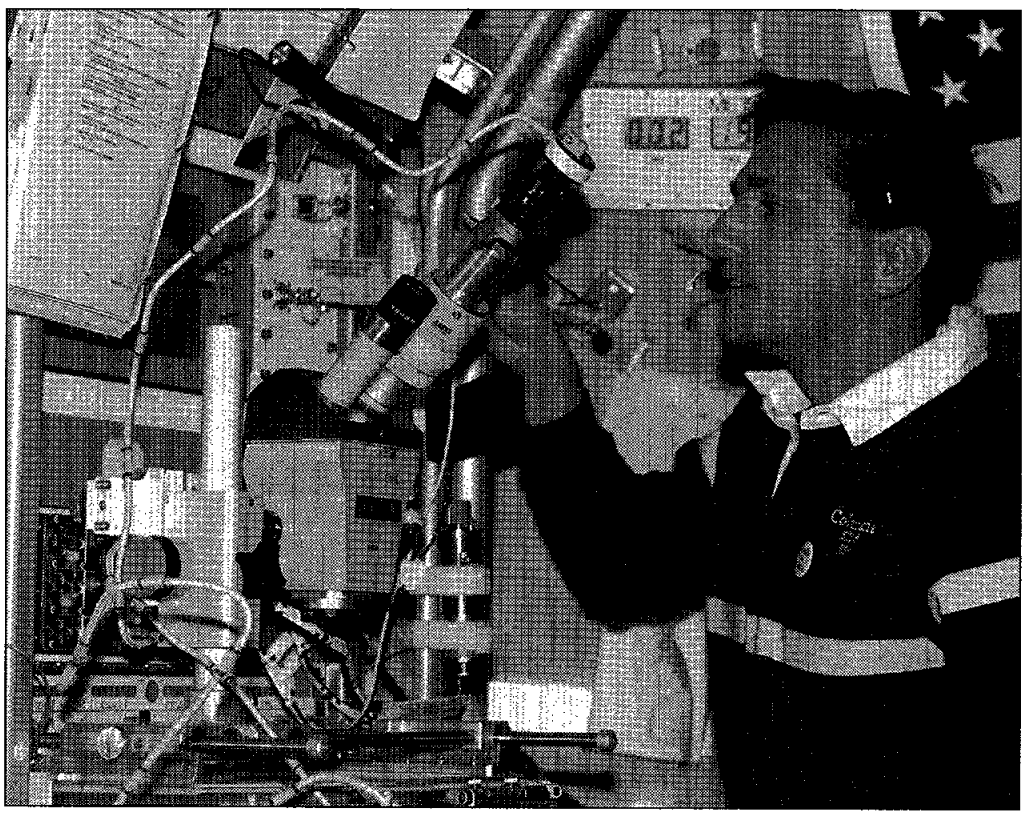

NASA Photo 97E5001

STS-94 Mission Specialist Donald Thomas uses a microscope at the glovebox in the Spacelab module during flight day five activities. Science activities onboard *Columbia* moved smoothly through the 16-day mission. Crew members conducted nearly three dozen experiments in combustion, materials science, and protein crystal growth sponsored by the space agencies of four nations.

Science surpasses expectations

Combustion, materials and protein crystal growth scientists got as much or more than they had hoped for during the two-week STS-94 mission, surpassing expectations that had to be postponed when STS-83 ended early.

After the fastest shuttle and crew turnaround in history, the astronauts aboard *Columbia* sailed through nearly three dozen experiments sponsored by the space agencies of four nations with ease that belied their complexity and importance to life on Earth.

"Science teams are getting everything they hoped for, and in some cases, more than they hoped," said Mission Manager Teresa Vanhooser of Marshall Space Flight Center. "We're seeing a lot of smiling faces in the science operations areas."

Commander Jim Halsell, Pilot Susan Still, Mission Specialists Janice Voss, Mike Gernhardt and Don Thomas, and Payload Specialists Roger Crouch and Greg Linteris were scheduled to land at Kennedy Space Center on Thursday, weather permitting.

Throughout the mission, the oldest shuttle in the fleet provided a virtually trouble-free stage for the microgravity investigations that will be instrumental in building a bridge to the International Space Station research of the 21st Century. A key component used for the first time on STS-94 was the innovative EXPRESS Rack, which stands for EXpedite the Processing of Experiments to the Space Station. The EXPRESS Rack replaced a Spacelab double rack and housed two experiments and tested the design, development and adaptation of the modular hardware.

Some of the "flashiest" experiments of the mission were designed to help improve combustion efficiency on Earth. Scientists predict that a mere 1 percent improvement in combustion efficiency could save $1 billion dollars in American energy expenditures each year and significantly reduce the amount of pollutants spilled into the atmosphere. Thomas said that by July 13 the crew already had completed more test runs than had been planned.

"We had planned to do about 150 burns, total combustion experiments up in space," Thomas said.

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Open house needs volunteers for center wide jobs, activities

JSC will open its doors for a "behind the scenes" look by the general public from 9 a.m.-4 p.m. Saturday, Aug. 23, and committee members are seeking volunteers to help visitors explore the space program.

Event organizers are asking employees to volunteer their time to fill the many needs visitors will have during the event. Volunteers will help at water stations, with clean up, provide directions at JSC gates and a variety of other activities that will help visitors enjoy their space experience.

More than 18 buildings at JSC, Ellington Field and the Sonny Carter Training Facility will be open to the public. The event features more than 100 different exhibits and displays.

In the past, JSC's one-day event has attracted as many as 70,000 guests from all over the state of Texas and across the country.

Guests attending the JSC Open House will see research and facilities and take part in a variety of demonstrations. Visitors can learn about life on Mars, the different space suits astronauts wear and tour the shuttle and space station mockups in Bldg. 9, the Neutral Buoyancy Lab and Mission Control.

For more information on what type of volunteers are needed, employees may call Kacy Carraway at x35045. Employees interested in volunteering, also may call Carraway.

For more general information on the open house call John Lawrence at x35111.

New benefits statements, handbook out soon

By Karen Schmidt

JSC's Human Resources Office is in the process of sending all civil servants new personalized benefit statements and a handbook that will give more information about the wide range of benefits available.

The new statements and handbook are the result of a product improvement initiative intended to drive down costs, improve accuracy and speed employees' access to their current benefits status.

In the past, employees could request a two-page annual benefits summary that focused primarily on retirement benefits. The new benefits statement expands that focus to include detailed information on the full range of employee benefits that are important throughout a career from the first day of employment to retirement and beyond.

"When we developed the old benefit statement, our experience and technology were somewhat limited and most of our employees were covered under the Civil Service Retirement System," said Mike Stewart, of Human Resources' Employee Services Office. "Now most of our employees are covered under the Federal Employee Retirement System and the benefits are much more complex and employees are more interested in the details."

The new benefit statement is eight pages long and divided into several categories and career scenarios. It contains personal information on service dates, pay, life and health insurance coverage, leave, retirement, social security, both short and long-term disability, separation information, death benefits and Thrift Savings Plan details.

Stewart said the current plan is for all employees to receive their statements annually after government-wide pay increases. Since the report only takes moments to print, employees may make individual requests at any time throughout the year.

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Cosmic rock hound begins robotic prospecting on Mars

The Mars Pathfinder rover is making important discoveries as it begins its sojourn across the Red Planet's surface, examining a diverse collection of rocks with nicknames like "Barnacle Bill" and "Yogi" in what appears to be an ancient flood plain.

The rover, itself named Sojourner Truth, was performing to the highest expectations of its designers, who are still learning how to drive the first mobile probe to land on the fourth planet from the Sun. Sojourner's Alpha proton x-ray spectrometer was being used to determine the chemical content of the rocks by bouncing sub-atomic particles off their surfaces.

"The site is everything we hoped it would be," said Matthew Golombek, Pathfinder project scientist. "We are finding more and more surprises as we look in detail at the rocks and terrain."

Because all of the rocks around the landing site appear to be leaning in the same direction, scientists believe the area once was the site of massive floods. And the bright reddish color of the soil points to the

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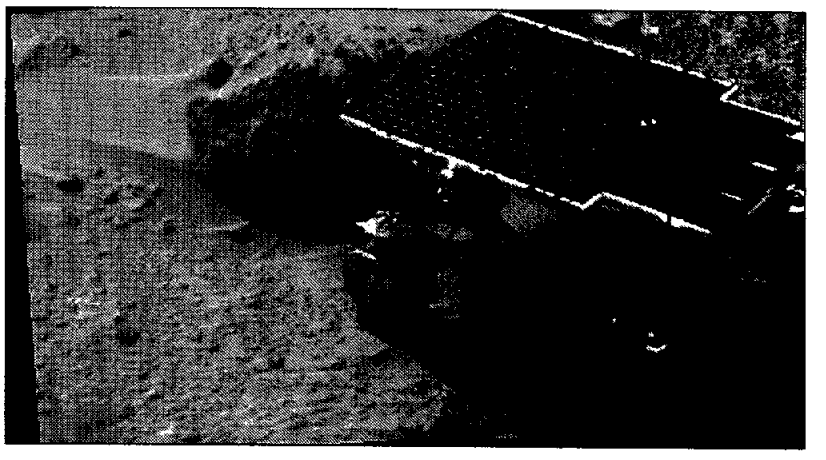


Sojourner's first analysis of a rock on Mars begins with the study of Barnacle Bill, a nearby rock named for its rough surface. The Alpha Proton X-Ray Spectrometer was used to determine the elements that make up the rocks and soil on Mars.

Cosmonauts expect to restore power with space walk

By John Lawrence

Contingency planning to restore power to the Russian Mir Space Station continues to evolve and mature in the wake of the June 25 collision with a Progress resupply vehicle.

American Astronaut Mike Foale said the planning and repair work provide an opportunity for the two countries to get ready to maintain the future International Space Station.

"We're going to have events like this, I think, in the future in our combined space programs," Foale told NASA Administrator Dan Goldin from on board Mir. "And the way we're learning to work together, the way we're understanding how people respond to these emergencies, is very, very useful."

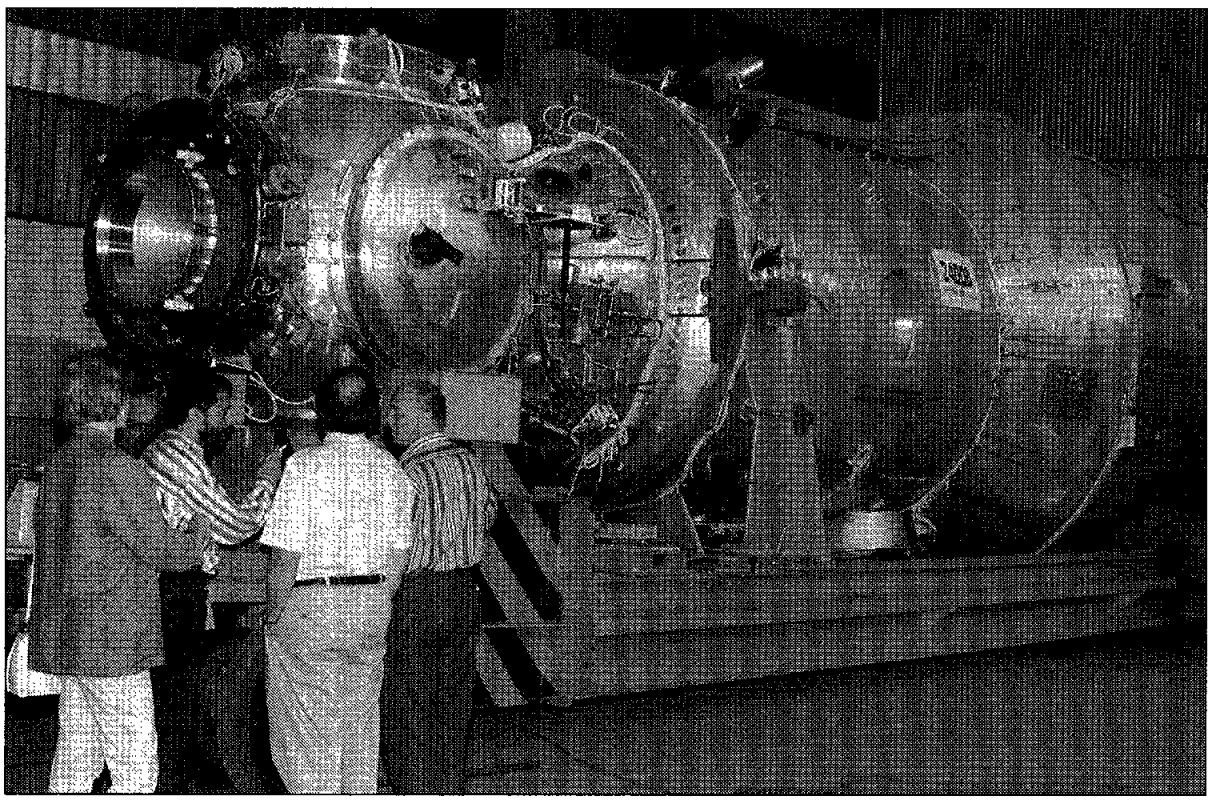
Plans now focus on the two cosmonauts entering the unpressurized Spektr module to install a specially manufactured plate. Cable connections will be reestablished through junctions built into the plate, which will be mounted between the node to which the Core module and Spektr are attached. The cables will route the flow of power from the three undamaged Spektr solar arrays to maintain proper charging of Mir's batteries, and will restore the capability to gimbal the arrays for maximum exposure to sunlight.

NASA's space walk experts have worked closely with their Russian counterparts to fine tune plans, for the space walk. Mir 23 Commander Vasily Tsibliev and Flight Engineer Alexander Lazutkin will conduct the space walk while Foale will remain in the lower compartment of the Soyuz capsule.

Goldin spoke to Foale during a brief communications opportunity Tuesday, July 8. Foale displayed the modified hatch on downlink television, saying, "This is what was brought up on the Progress that's going to be used to allow the pass-through of the umbilicals from Spektr. This is going to attach onto the end cone of the Spektr. On the inside of the node the connectors you see there will be accessible to us. On the backside there already will have been stuck some cables—like a kind of Medusa of cables—and then during the EVA Vasily and Sasha will connect these cables to the power cables that are now floating free in Spektr, which will provide the means to obtain the power from Spektr to the base block."

Procedures for the repair were being worked out by two veteran Russian cosmonauts with space walking experience, Sergei Krikalev and Nikolai Budarin, working with Russian and U.S. specialists in the Hydrolab facility at the Gagarin Cosmonaut Training Center. Krikalev and Budarin practiced procedures in a mockup of Spektr. In a communications session with the Mir, they told the Mir 23 crew that the internal space walk would be difficult, but can be performed successfully.

The Mir crew was to have practiced the internal space walk on orbit this week. The suited cosmonauts were to rehearse using the transfer node and the Kvant-2 module, because its hatch is similar in design and size to the Spektr module hatch. Following this exercise, a joint U.S./Russian readiness review was to occur before the final "go."



Work on the Service Module, the first fully Russian contribution to the International Space Station planned for a December 1998 launch from Russia, reached a milestone this month as the module's electrical analog was moved to prepare for tests that will simulate the vibrations of launch. Looking at the electrical analog in Moscow as it was prepared for shipment on June 23 from left are NASA's Elena Maroka and Lee Lantsman of Boeing, both with NASA's Moscow Technical Liaison Office; Sergei Shaevich of Russia's Khrunichev State Research and Production Space Center in Moscow; and Vladimir Yain of the Russian Space Corporation-Energia. A flight-like simulator of the Service Module, the electrical analog was built at Khrunichev in Moscow and was moved to TsNIMASH, a subcontractor in the village of Sergey Posad, near Moscow, for testing. The Service Module electrical analog is used to precede some flight article tests and undergo other tests in lieu of the flight article. Once the tests simulating the vibration and shock environments of launch are completed in Sergey Posad, the analog will be shipped to Energia in Moscow to begin a series of integrated systems tests as a precedent to arrival of the flight article. Assembly of the Service Module flight article continues at Khrunichev, and it is expected to be shipped to Energia for testing in October 1997. The Service Module will provide the early navigation, control, power, life support systems and crew quarters for the International Space Station prior to the arrival of later U.S. modules.

Station service module begins launch testing

By James Hartsfield

Work on the International Space Station's Service Module, scheduled to be the third major station element to launch, reached a milestone recently as an electrical analog for the module in Moscow began vibration and shock testing that simulates the rigors of launch.

The analog module, a flight-like simulation of the Service Module, is used to precede some flight article tests and undergo other tests in lieu of the flight article. Once the vibration and shock testing is completed, the analog module will be shipped to Energia facilities in Moscow.

The Service Module will be the first fully Russian contribution to the International Space Station and will serve as the early cornerstone for the first human habitation of the station. It is scheduled to be launched unpiloted in December 1998 as the third station element to reach orbit, docking by remote control with the already orbiting Functional Cargo Block and Node 1.

The 42,000-pound module, similar in layout to the core module of Russia's Mir Space Station, will provide the early station living quarters; life support system; electrical power distribution; data processing system; flight control system; and propulsion system. It also will provide a communications system that includes remote command capabilities from ground flight controllers.

Although many of these systems will be supplemented or replaced by later U.S. station components, the Service Module will always remain the structural and functional center of the Russian segment of the International Space Station.

The module will have a wingspan of 97.5 feet from tip to tip of the solar arrays, and it will be 43 feet long from end to end. The Service Module contains three pressurized compartments: a small, spherical transfer compartment at the forward end; the long, cylindrical main work compartment; and the small, cylindrical transfer chamber at the aft end. An unpressurized assembly compartment is wrapped around the exterior of the transfer chamber at the aft of the module. The assembly compartment holds external equipment such as propellant tanks, thrusters and communications antennas.

The Service Module will include four docking ports, one in the aft transfer chamber and three in the spherical forward transfer compartment—one facing forward, one facing up and one facing down. The aft docking port has a probe and cone docking mechanism to allow dockings by Progress resupply spacecraft and Soyuz piloted spacecraft.

Living accommodations on the Service Module include personal sleeping quarters; a toilet and hygiene facilities; a galley; and a table for meals. The module will have a total of 14 windows. Exercise equipment will include a NASA-provided treadmill and a stationary bicycle. The crew's wastewater and condensation water will be recycled for use in oxygen-generating devices on the module, but it is not planned to be recycled for use as drinking water. The module also will provide data, voice and television communications with Mission Control Centers in Moscow and Houston.

The Service Module will be launched on a Russian Proton booster. At launch, many systems will be in a standby mode. Once in orbit, preprogrammed commands onboard will fully activate its systems, the solar arrays will be deployed and the communications antenna will be deployed. The Service Module then will become the passive vehicle for the rendezvous with the already-orbiting Functional Cargo Block and Node 1 spacecraft. As the passive "target" vehicle, the Service Module will maintain a station-keeping orbit as the Functional Cargo Block/Node 1 vehicle performs the rendezvous and docking via ground control and the Russian automated rendezvous and docking system.

Astronauts may now vote from space as governor signs bill for electronic transfer

By Toni Loftin

Astronauts who spend long periods of time in orbit may now cast their votes via electronic transfer.

NASA Administrator Dan Goldin, JSC Director George Abbey and Astronaut John Blaha attended a signing ceremony July 9 at the State Capitol for House Bill 841. Gov. George. Bush signed the bill that will enable orbiting astronauts to cast their ballots on election day.

The bill, sponsored by State Sen. J.E. "Buster" Brown of Lake Jackson, came about as a result of Blaha missing the election in November during his stay on Mir. Texas state law at the time did not allow voting by electronic mail.

Authored by Rep. Mike Jackson of LaPorte and Rep. Patricia Gray of Galveston, the bill contains provisions for using NASA's electronic transmission program to send ballots to astronauts. Going into effect on Sept. 1, the law also is intended to benefit future astronauts working aboard the International Space Station.

"Under our current election laws which allow lengthy periods for early voting, it was difficult to imagine any scenario where a registered voter in Texas would be unable to find time to cast their ballot either by mail or in person," Jackson said in a statement issued after the signing. "That all changed with the cooperative space exploration program between the United States and Russia where our astronauts are spending months at a time on the Space Station Mir."

Also in attendance for the signing were JSC Associate Director for Management Sue Garman, Phase 1 Program Manager Frank Culbertson, Phase 1 Program Deputy Manager Jim Van Laak, and Houston City Council Member Rob Todd.

Internet News: Web sites help Inspection 97 team inform public, plan event

JSC is using the Internet to invite industry leaders to the center for this fall's Inspection 97 activities, and the internal web site is providing a mechanism for organizers and volunteers to coordinate the preparation of exhibits.

Inspection 97, scheduled for Nov. 12-14, will give industry, business, community and education leaders a chance to inspect, at the working level, the technologies and facilities that JSC uses to meet its science, engineering, operations and management challenges.

Inspection 97 will feature more than 100 exhibits and mini tours of several facilities at JSC. Exhibit categories will include: Engineering and Technology, Space Sciences, Medical Sciences, Operations and Space Program Overviews.

The external web site, built by Stephanie Castro, of the Space and Life Sciences Directorate's Program Integration Office, under the guidance of Inspection 97 coordinator Doug Blanchard, chief of that directorate's Earth Science and Solar System Exploration Division, provides information about the Inspection 97 activities and schedule and opportunities for potential participants to request additional information, join the Inspection 97 mailing list or sign up to attend.

It also provides detailed information about exhibits and demonstrations featured in last year's Inspection Day activities, which likely will be among this year's features as well. In addition, the page provides links to JSC's space shuttle, shuttle-Mir and International Space Station web sites, and to JSC's Office of Technology Transfer and Commercialization home page.

The internal web site, also designed by Castro, shares information important to planning, organizing and executing Inspection 97 activities. There are links to a list of directorate representatives on the Inspection 97 team, to presentations and plans that have been formulated to date, to an Inspection 97 organization chart, to minutes of planning meetings, to a list of the exhibits planned so far, and to a "compass chart" that represents what the public will see in the Inspection Day event program book and posters at each exhibit.

In addition, it allows anyone to add a potential contact to the Inspection 97 mailing list so that JSC can attract the thousands of participants expected in November and keep them up to date on preparations.

The internal site also provides a "mail to" link that will automatically allow employees using the site to send an electronic mail message to the address "inspection1@jsc.nasa.gov" for response by the Inspection 97 team.

Community News

Friends, family enjoy workshop

Return to community schools with new insights, ideas, tools

Amid shouts of glee, wails of disappointment and gushing jets of pressurized water, JSC employees were treated on a recent Friday morning to a barrage of pressurized water rockets launched from the parking lot east of Bldg. 29.

The launch of the water rockets, made from 2-liter plastic beverage bottles, was the culmination of a one-week teacher workshop held at JSC June 9-13. Each of the 21 educator participants was asked to demonstrate new-found knowledge of rocketry and aerodynamics by designing and assembling a 2-liter water rocket with customized nose cones and stabilizing fins. The result was an enthusiastic but thoroughly wet group and a broad range of vehicle trajectories and altitudes.

This group of educators/rocket scientists comprised the fifth-year class of JSC's Family and Friends Aerospace Professional Development Workshop. Organized specifically for professional active classroom educators who are family members or friends of JSC and contractor employees, the free workshop allowed participants to spend a full and intense week at JSC learning about a variety of space subjects and the broad scope of work done at the center.

The workshop is one of a series of educator workshops offered by the Public Affairs Office's Education and Information Services Branch each summer.

"The Family and Friends workshop is an opportunity to show our gratitude to the many employees who help JSC meet its educational goals throughout the year," said Billie Deason, Public Affairs' Education Team lead.

The quality of the educator workshops JSC produces would not be possible without the enthusiastic support and cooperation of organizations and employees around the center, Deason explained, thanking all those who support endeavors to bring space into the classroom.

The teacher participants, who became students for the week, represented school districts from around the Houston area, as well as from Killeen, Orange, and Corpus Christi, Texas, and Lafayette, La. They are currently teaching in elementary, middle and high schools in their districts.

Workshop Coordinators Mae Mangieri and Norman Chaffee, assisted by Oklahoma State University Education Specialist Charles Anderson, provided the participants with five diverse days of educational and classroom activities, briefings, demonstrations, laboratory and facility visits, and behind-the-scenes interactions with JSC's engineers and scientists. After a presentation by Astronaut Ellen Baker, the teachers were able to visit Mission Control, Ellington Field, the Sonny Carter Neutral Bouyancy Laboratory, thermal vacuum chambers A and B, the shuttle and space station mockups, and the robotics labs, among others. The teachers also were briefed on the International Space Station Program, the X-38 Project, and the Lunar/Mars Exploration Program now being planned.

"The visit to Ellington and to the NBL was just awesome," said Ramona Moore, who teaches at Walter Hall Elementary School in the Clear Creek Independent School District.

Complimentary visits to Space Center Houston and to the new Moody Gardens Discovery Museum were included as extracurricular events, and most of the teachers participated in these enrichment activities.

Embedded in the comprehensive exposure to JSC's broad set of activities, and at the heart of the workshop, was a significant set of "hands-on" classroom activities covering many space topics, which the teachers can take back to their classrooms in the local community, along with new space program insights, knowledge, and techniques.

Above: Teachers Nancy Cope, Jackey Colton, Ramona Moore, Jackie Casavechia and Nancy Clifford participate in a hands-on learning demonstration during the recent Family and Friends Teacher Workshop. Left: JSC's Jose Rangel gives teacher Patricia Kibicek a chance to feel what it is like to sit in the cockpit of a T-38.

"I hope to bring back to my students a way of presenting science across the curriculum, and more efficiently integrate it into all classroom lessons and activities," said Janice Scanlon, a teacher at Barber Elementary School in the Dickinson district. "I want to be able to share the idea of space as not only our future, but a great part of our world today."

"I can use this material to motivate kids to want to learn", added Shirley Boice, a teacher at Garden Villas Elementary School in the Houston Independent School District.

The Family and Friends Workshop received high marks from all the participants.

"We just needed more time" for everything, said Patricia Clark.

Patricia Kubicek from Corpus Christi said the thorough, full and demanding workshop was "lots of fun, like a mini-vacation."

USA team makes 'GIANT' strides in space station planning

The Globally Interconnected Advanced Network Telepresence—or GIANT—program is being developed by United Space Alliance contractors in order to help managers from global space agencies coordinate the activities of the International Space Station crew.

The task of coordinating, planning and executing the daily activities of the six-person crew on a weekly basis is unparalleled in history. Communications coverage, attitude/trajectory, electrical power, crew, and payload requirements are some of the variables operational planners must consider.

These elements must be modeled and integrated to avoid conflicts between systems and payloads on different portions of the station. In addition, planners must coordinate between operational centers spanning nearly every time zone in the world, 18 cultures and 12 languages.

A new planning concept has been developed for the space station which differs dramatically from the current space shuttle method. Called "Just-In-Time Planning," it requires the operations planner to spend his or her week scheduling the station onboard activities for the following week.

Using videoconferencing and data and application sharing, the GIANT program hopes to enhance station planning capability. The use of commercial off-the-shelf hardware and software results in increased time and cost efficiency, and offers the opportunity to exploit the rapid development of new capabilities at steadily lower cost.

USA GIANT Project Manager Jeff Durham, Lead Project Engineer Jim Lyons and Barrios employees Kevin Haase and Ochieng Campbell are working to evaluate telepresence technologies and define the operational needs the system must satisfy. Consulting support is provided by engineers at NASA's Jet Propulsion Laboratory.

Video rates of 15 to 30 frames per second, full color, with moderate to good resolution, are obtainable over a digital telephone connection using modern compression techniques on the PC-based desktop systems being evaluated. The use of such ISDN connections provides a simple videoconference connection activated using a user-friendly point-and-click interface not much more difficult than dialing a phone.

Data exchange is even more important for the ISS Operations Planner, and several technologies are being examined to meet these requirements. The approach of the GIANT project team is to implement graphical, real-time, interactive data exchange as a way to reduce the number of face-to-face meetings. Users will be able to discuss and annotate any document on an electronic whiteboard, allowing simultaneous edits from multiple sites. One user may write comments and draw in red, another in blue, while a third highlights important text or uses a pointer.

Perhaps the most powerful data interaction capability is that of application sharing, in which a user in Houston can launch an application and share it with the members of a conference and participants in another locations may edit he document.

GIANT reached a significant milestone in March when it was used operationally for the first time to support current operation planning work. A video- and data-conference was held with representatives from NASDA, the national Japanese space agency in Tokyo, to discuss a standard Operations Planning Flight Controller software tool being developed for the Mission Control Center in Houston.

The software developers gave a real-time demonstration of the user interface and the functionality of the application prototype to their counterparts in Tokyo while simultaneously interacting via video.

Tickets available in advance

Mexican-American engineers, scientists host scholarship dinner

The fourteenth annual scholarship banquet sponsored by the Society of Mexican-American Engineers and Scientists will take place at 7 p.m. Saturday, Aug. 2, at the Gilruth Center Ballroom.

This year's banquet, entitled: "The New Millennium: New Challenges in Engineering and Science," will bestow $10,000 in scholarships to deserving local high school and college students.

The event will begin with a tour of the Mission Control Center at 5:30 p.m., followed by a social hour at 7 p.m. and dinner at 8. JSC Director George Abbey will give the keynote address.

The annual gala is designed to promote the involvement of professional engineers in community projects and to inspire students to pursue their educational dreams. Through the opportunities provided, MAES hopes to improve educational and employment opportunities for engineers and scientists through cooperative efforts with industry and government.

MAES takes an active role in this endeavor by encouraging and assisting financially disadvantaged students for careers in engineering and science. Since 1984 MAES has given more than $120,000 to deserving high school and college students. The majority of the scholarship funds are raised through industry and government donations.

The Society of Mexican-American Engineers and Scientists is a national non-profit organization with four Houston area chapters.

Tickets to the banquet are $25 per person. For more information, contact Gerald Valle at x38835. or Mike Ruiz at x38169.

JSC Safety Alert

Lightening Strike Awareness

What Happened

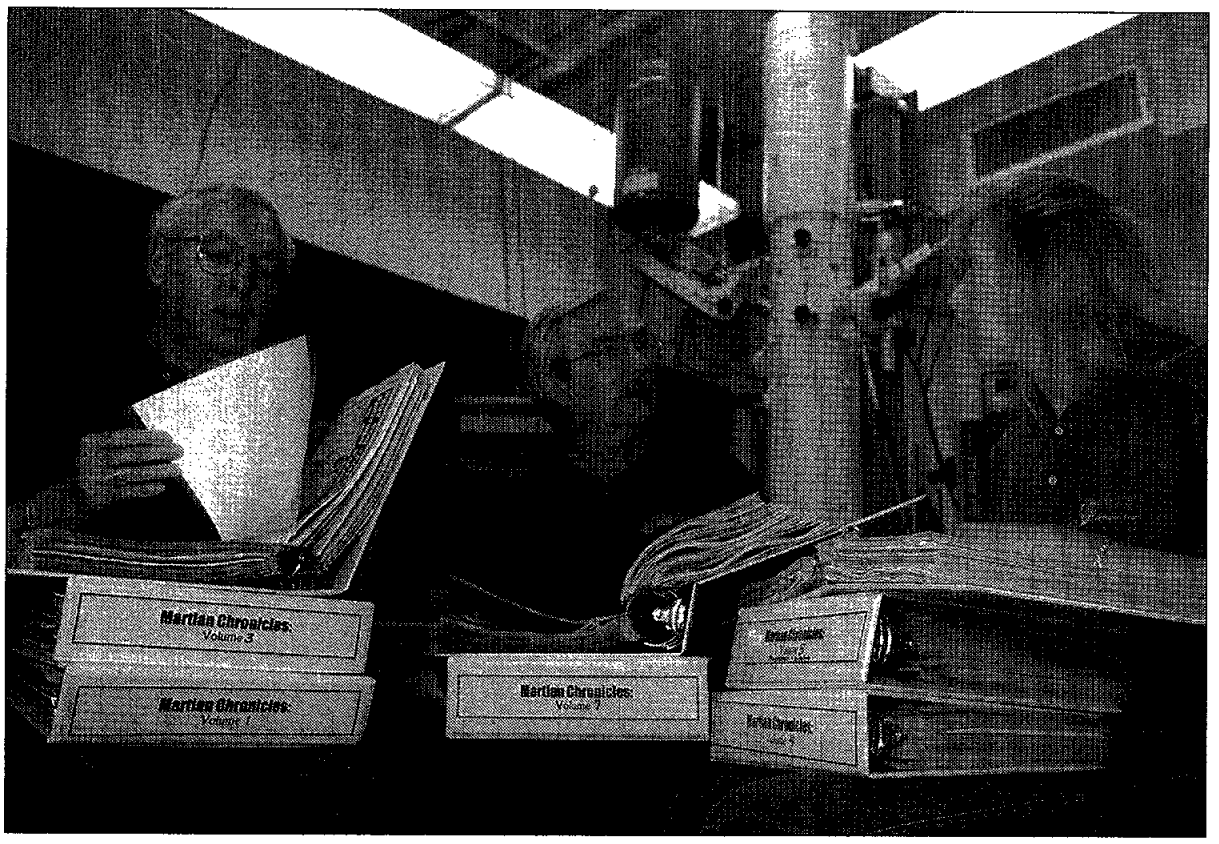
While accurate data is elusive, there is general agreement that lightning is one of the leading weather-related cause of deaths and injuries. Numerous outdoor work-related activities have been noticed at JSC during prolific lightning storms. While people working outdoors during lightning producing storms have been fortunate so far, continued lack of attention to safety during these storms will eventually result in catastrophe.

What You Can Do

When you first hear thunder, begin to plan your lightning defense. Lightning often precedes rain, so don't wait for the rain before suspending activities. If outdoors, avoid water, metal objects including electric wires, fences, structural steel, machinery, motors, and power tools. Unsafe places to be include tents, open-sided rain shelters, underneath trees, near flagpoles, high mast light poles, facility roofs, high ground, and wide open spaces where you are the tallest object. Where possible, find shelter in a building or in a fully enclosed metal vehicle such as a car, truck or van with the windows completely shut.

Lightning's proximity can be referenced by noting the time from its flash to the bang of the associated thunder. For each five second count from FLASH to BANG (F-B), lightning is one mile away. Thus a F-B of 10 = 2 miles; 15 = 3 miles. It is recommended that you activate your lightning safety defense (seek shelter) no later than an F-B count of fifteen (3 miles).

If indoors, stay away from open doors and windows. Do not use the telephone, and, if possible, take headsets off. Lightning may strike electrical and phone lines and induce shocks. Turn off and stay away from appliances, computers, power tools, and television sets, if possible.



Surviving Scientific Scrutiny

Left: JSC scientists David McKay, Everett Gibson and Kathie Thomas-Keprta look through the "Martian Chronicles." The chronicles are eight volumes of letters, articles and awards the team has cataloged during the 11 months since the announcement of their discovery of evidence of primitive life on Mars.

By Karen Schmidt

In August of 1996, a team of JSC scientists revealed they may have found evidence of primitive life on Mars. Since the announcement, the lives of planetary scientists David McKay, Everett Gibson and Kathie Thomas-Keprta have not been the same.

"It has been almost one year since our original paper was published and our hypothesis has survived more or less intact and is still the topic of a major scientific debate," McKay said. "The concepts and interpretations that we proposed have activated the scientific community to investigate and debate many aspects of possible life on Mars, in extreme environments on and within the Earth, and in other locations in our own and other star systems."

'It has been almost one year since our original paper was published and our hypothesis has survived more or less intact and is still the topic of a major scientific debate.'

—David McKay

The JSC team and six other NASA and university research partners spent two years investigating the mineral features of a rock—believed to be of Martian origin—that fell to Earth as a meteorite. The minerals suggest biological activity and possible microscopic fossils of primitive, bacteria-like organisms that may have existed more than 3.6 billion years ago.

"While our interpretations have been challenged, our data have not been significantly criticized," McKay said. "Many critics remain, and undoubtedly new ones will arise, but we contend that our original interpretation remains the simplest and most encompassing hypothesis for explaining the complex and diverse data on this meteorite."

McKay and Gibson are at NASA's Jet Propulsion Laboratory, anxiously awaiting scientific results from Mars Pathfinder.

"Pathfinder will characterize the Martian surface," Gibson said. "It will not answer any of the questions which we have posed but it is one in a series of precursor missions that we need to do to get ready to get return samples from Mars. We hope it goes well."

Thomas-Keprta will watch the mission results carefully, looking for the same mineral she discovered in the Mars meteorite.

"Pathfinder has a magnetic experiment on it and the scientists will be looking for magnetite on Mars," she said. "It will be very interesting to see if any grains stick to these magnets and confirm that magnetite does exist on Mars."

The team was surprised by the reaction of media and the public, but is ecstatic about the excitement its research has generated within the science community.

"What is exciting is that we have got biologists talking to geologists and chemists," McKay said. "I have gone to universities to give a talk and the biology group will show up and the geologists will come. They almost never talk to each other inside the university. Yet, they come to this talk and start arguing back and forth, and I love that. Our research has produced a multidiscipline focus."

Of all the awards the team has received, Gibson said the most gratifying aspect of the discovery is respect shown by his scientific colleagues.

"When they see me at a meeting, my scientific peers and colleagues say y'all did that well and you did it the right way," he said. "It makes one feel good and it's very satisfying."

The announcement has generated new research, and the team welcomes the challenges to the concepts of ancient life on Mars.

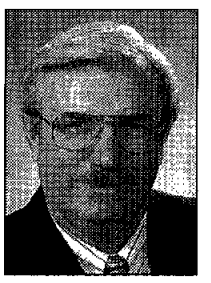
"We ourselves want to make sure that we have come up with the right answer," Thomas-Keprta said. "If you do good science you will produce more questions than answers and that's what we have done. Any day that I come in and have more questions than answers is a good day."

Since the Aug. 7, 1996, announcement, the team of nine scientists has conducted more than 500 interviews and presentations. Interviews range from a telephone interview with Vatican Radio to a talk before the Swedish National Research Council that awards Nobel Prizes.

"The number of requests for our time came as a surprise to us," Gibson said. "We have spoken to audiences as large as 5,000. We have given briefings to Congress, the National Academy of Sciences and have spoken to groups all over the world."

While the travel, interviews and presentations have cut into their research time, Thomas-Keprta said it's important and rewarding.

"Both jobs need to be done and both parts are important," she said. "The general public cannot understand a science paper, but they do understand a slide show."



'The number of requests for our time came as a surprise to us. We have spoken to audiences as large as 5,000. We have given briefings to Congress, the National Academy of Sciences and have spoken to groups all over the world.'

— Everett Gibson

Requests for interviews and presentations continued at a hectic pace at the beginning of the year but McKay had to call it quits in March when he underwent heart surgery. His recovery is going well and he has recently returned to work full time, but is limiting his travel.

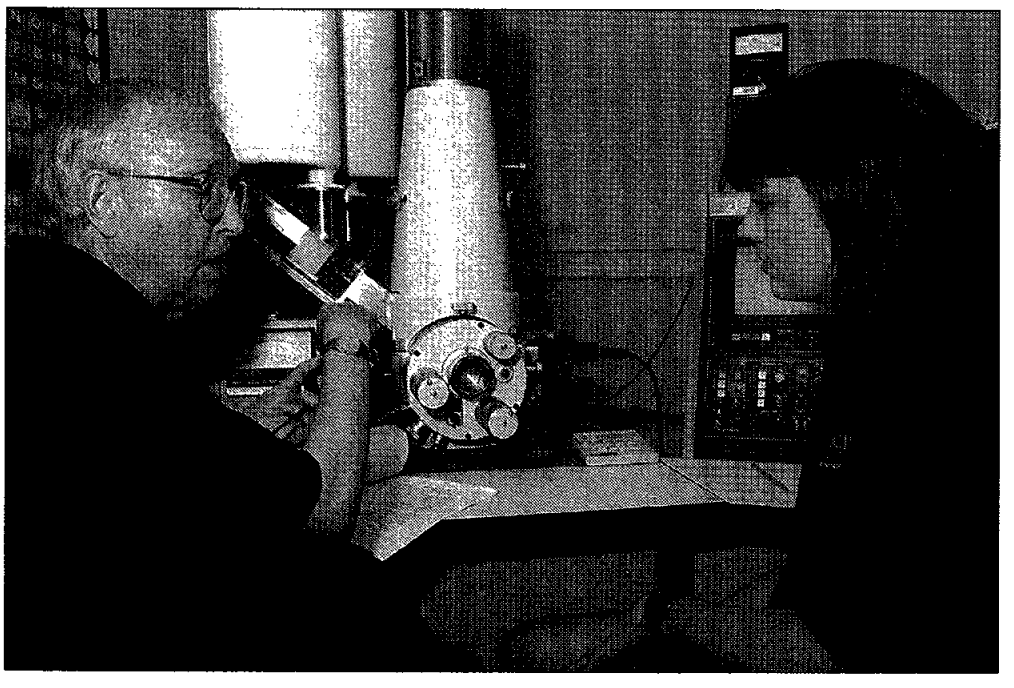
"I am making an effort to avoid stressful situations; I just go home or chase people out of my office," he said.

The group found it difficult to keep up with all the letters, articles and awards until Gibson began collecting them in four-inch binders. He recently completed volume eight of what he calls the "Martian Chronicles."

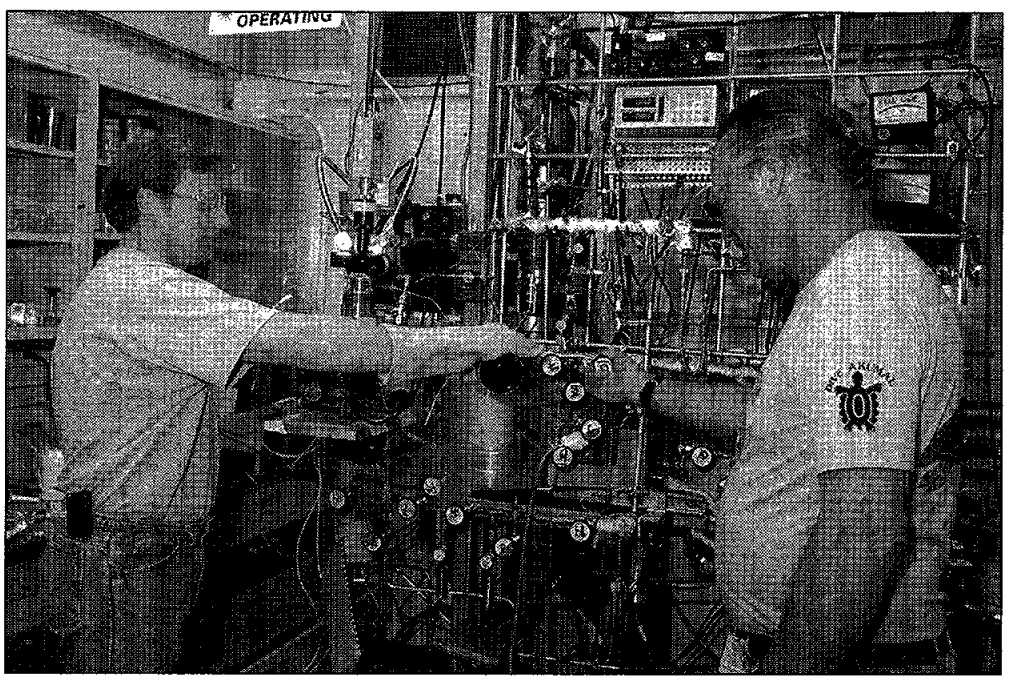
The team also has garnered numerous awards. In May, the National Space Society presented the Space Pioneer Award, which recognized not only the JSC scientists but their colleagues as well, including Hojatollah Vali of McGill University in Montreal; Chris Romanek from the University of Georgia; and Richard Zare and his students Simon Clemett, Claude Maechlin and Xavier Chiller of Stanford University.

"Their findings galvanized interest in Mars, space exploration and scientific discovery," said David Brandt, executive director for the National Space Society. "But even more importantly, their story demonstrates how continued investment in technology gives us the opportunity to take a second look, to challenge long-standing assumptions and to expand knowledge."

"Time" magazine awarded the scientists the Best of Science of 1996 while "Discover" magazine gave the team both the Find of the Century Award and the Top 1996 Science Story. "Aviation and Space" lauded the find

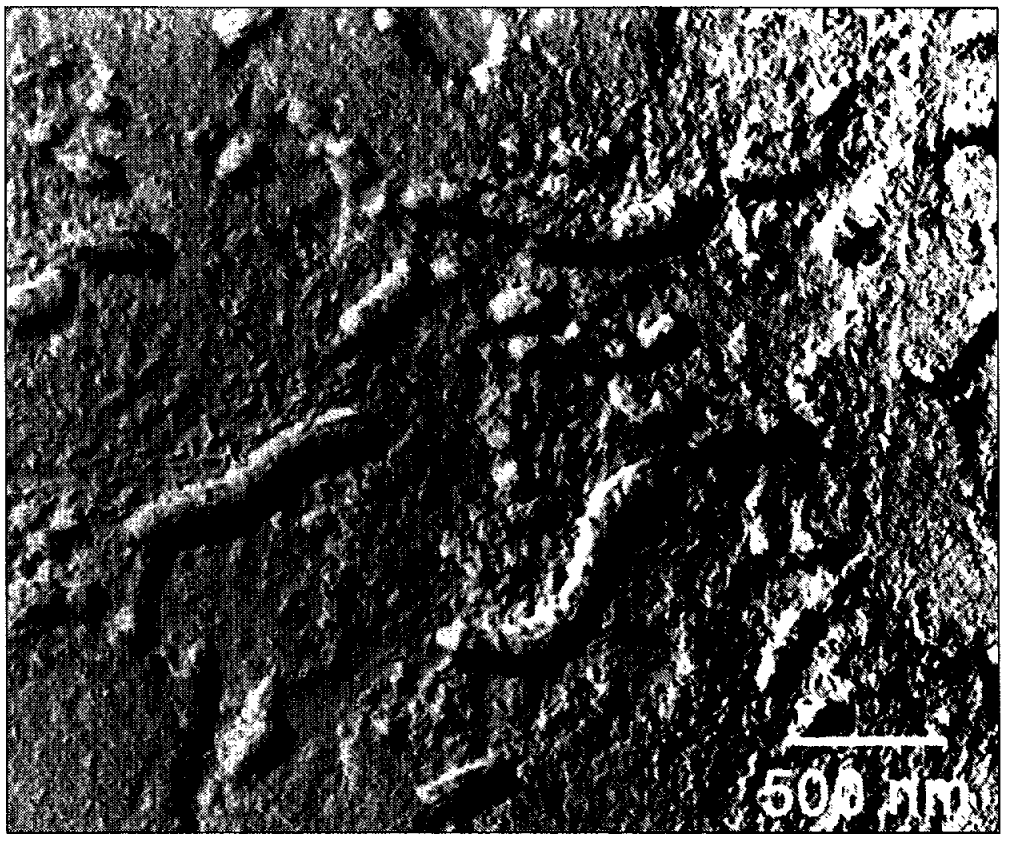


Above left: McKay instructs Kate Graham, a summer intern, on how to insert samples into the scanning electron microscope. Graham will spend the summer investigating rocks from Yellowstone that will help the team understand how samples live in hot hydro-thermal areas. The team is focusing its attention on Earth rocks to verify the Mars discovery.



Above right: From left, Rick Socki of Lockheed Martin, with the help of Geology professor Eugene Perry from Northern Illinois University, pours nitrogen into a vacuum extraction line to separate gases.

JSC scientists' lives evolved dramatically after their discovery of ancient life on Mars shook the Earth one year ago



Right: This high-resolution electron microscope image of a cast, or replica, from a chip of the Martian meteorite shows the outline of what are believed to be microscopic fossils of bacteria-like organisms that may have lived on Mars more than 3.6 billion years ago. Scientists made a cast of the original, then removed and imaged the cast to avoid harming the original with the electron beam. The tubular features are less that a micrometer in size, or about 1/500th the diameter of a human hair. JSC Photo S96-12299

as the best of what's new in 1996 by presenting a Laurel Award.

The late Carl Sagan wrote in a letter to Planetary Society members that "the recent discovery of possible life on ancient Mars is the most provocative and evocative piece of evidence for life beyond Earth. If the results are verified, it is a turning point in human history suggesting that life exists not on just two planets in one paltry solar system, but throughout this magnificent universe."

As the team began switching its focus from announcing the discovery to working with other scientists trying to verify its work, Thomas-Keprta discovered she had additional demands on her time of a personal nature. During the August press conference, Thomas-Keprta did not feel well and could not understand what was wrong. Three weeks later she found out she and husband, Sean, were expecting their first child.

"As of January, I was unable to travel so I was able to continue my research until Nathaniel's birth in April," she said.

As the team works with other scientists on verification, it also is beginning to explore other areas of the meteorite and other mineral formations on its surface. Other scientists contend that the carbonates may have been formed at high temperatures and therefore could not have supported biological activity. Thomas-Keprta is studying the other types of carbonates to confirm that the rock can have both inorganic and biological formations.

"It's sort of like having a penny in the rock and a quarter in the rock. They are both money but they are different," she explained. "The penny formed at low temperature and has evidence of biogenetic activity. I can say that but I haven't looked at the quarter yet. They have looked at the quarter, but not the penny. So the interesting thing is that different labs can be looking at the same rock but there are lots of different things in that rock. We have to make sure we are looking at the same thing."

The team also is focusing its attention on Earth rocks to verify the Mars discovery. Ongoing studies include volcanic rock flow from the Columbia River in Washington that houses a zoo of organisms, and rocks from Yellowstone that will help the team understand the composition of samples found in hot hydro-thermal areas.

"We recently discovered really tiny bacteria, much smaller than previously reported," McKay said. "We hope to be able to show that there are bacteria today that are living in one- or- two-kilometer depths that are very tiny and are in the size range of the Mars bacteria. "We think the Columbia River and Yellowstone rocks are the best examples of what it might have been like on Mars."

'We ourselves want to make sure that we have come up with the right answer. If you do good science you will produce more questions than answers and that's what we have done. Any day that I come in and have more questions than answers is a good day.'

—Kathie Thomas-Keprta

The team also has discovered that bacteria can develop other forms. One of these is very long skinny filaments that produce biofilms. These biofilms are a kind of membrane that provide a gathering place for food and hold bacteria together in a clump so they don't wash away.

"Biofilms are very common in terrestrial bacteria colonies and we think we now see remains of biofilms in the Mars rock," McKay said.

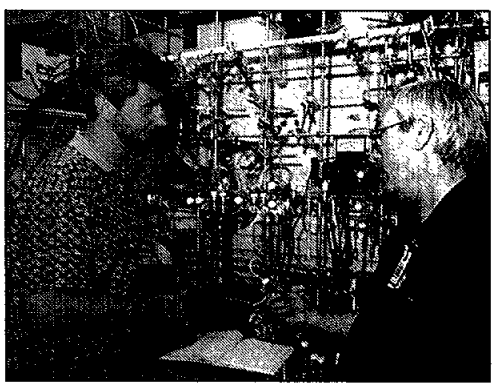
The studies of Mars meteorites have expanded recently with the announcement by NASA and the National Science Foundation of the selection of 16 proposals that will further study ALH84001—the same meteorite that the JSC team used in its research. The NASA grants were awarded under the Ancient Martian Meteorite Research Program, a coordinated project to investigate this and related meteorites in greater depth. The awards total about $1 million for the first year and about $500,000 for the second year. The new studies will focus on repeating and expanding the original findings and further investigation of carbon genesis and mineralogy; microbiology studies; organic chemistry; and age dating.

"It's amazing that a scientific project, published in a peer-reviewed journal, has affected the thoughts of everybody—from the most respected scientists to the man on the street," Gibson said. "It's very unusual for a group of scientists to publish a paper that results in a million and a half dollars dedicated to further study their results."

The future also holds many promises for the trio of planetary scientists. McKay would like to work on ways to use microbes to help support a human base both on the Moon and Mars.

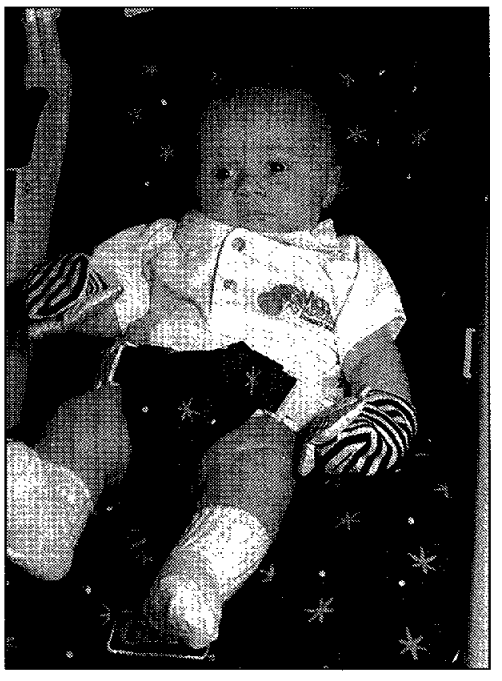
"Astronauts would harvest the microbes like you harvest vegetables on a farm and cook them and extract the useful things like hydrogen and oxygen to help support the space outpost," McKay said. "We are concentrating on the Moon because we have lunar samples. Lunar soil has collected solar wind elements in the outermost layer of each grain and this outer layer is a perfect place for microbes to live and grow. I have learned so much about microbes from studying the Mars rock, and it gave me more confidence to pursue the idea of a microbe farm." ❑

From left, McKay checks on the progress of an electron scan being analyzed by Penny Morris-Smith, a member of the Summer Faculty Program from the University of Houston-Downtown. Morris-Smith is studying volcanic rock flow from the Columbia River in Washington that houses a zoo of organisms.



From left, Chris Romanek of the University of Georgia talks with Everett Gibson on the separation of gases in the vacuum extraction line. Romanek is one of the original eight scientists to discover the fossils in the Mars rock. Romanek spent time in Sweden this past year briefing the Swedish National Research Council which awards Nobel Prizes.

The Mars Meteorite team includes, back row from left, Penny Morris-Smith, Anne Taunton, Everett Gibson, David McKay, Kathie Thomas-Keprta, Sue Wentworth, Carl Allen and Mary Sue Bell. Summer interns, seated from left, are Kate Graham, Susy McKay and Karen Tager.



The newest addition to the Mars Meteorite Team, Nathaniel Thomas Keprta, sports his new outfit.

From left, summer intern Anne Taunton learns how to prepare a sample for the electron microscope from Kathie Thomas-Keprta. Taunton also will spend her summer studying the hot rocks from Yellowstone.

JSC Photos by Steve Candler

28 Years Ago at MSC

'The Eagle has landed'

Reprinted from the July 25, 1969, Roundup

We did it!

"Tranquility Base here. The Eagle has landed," announced the flawless lunar landing of Apollo 11 at 3:18 p.m. on July 20, 1969.

And when Armstrong's heart rate rose to 156 at touchdown there were similar reactions on Earth as pride, awe and humility struck the hearts of administrators, flight controllers, programmers, contractors and everyone who had played a part, however small, in the accomplishment.

Communications were good during the landing as Armstrong took over control of the Eagle during the final seconds and maneuvered it past a football-field-sized crater filled with boulders to a smoother area at the Southern edge of landing site number 2 near the Sea of Tranquility.

Immediately after touchdown, he and Edwin Aldrin, lunar module pilot, conducted a checkout of the LM for contingency takeoff and gave a brief description of the lunar surface.

After verifying all systems as "go" for ascent staging and lunar stay, the crew requested permission from Mission Control to begin their moonwalk five hours earlier than planned.

Request granted, the landing crew began donning their Extra Vehicular Mobility Units, depressurizing the LM and otherwise preparing for exploration of Tranquility Base, Moon.

This EVA preparation took somewhat longer than anticipated, causeing a delay in the modified flight plan of about 12 minutes.

The Eagle's hatch opened at 9:39 p.m. At 9:51 Armstrong slid out onto the front porch, released the Modularized Equipment Stowage Assembly and started the black and white television camera that was to record man's first lunar surface activity for the people of Earth.

He then came slowly down the LM ladder, bounced once between the last rung and Eagle's large footpad and, at 9:54 p.m., placed his left foot firmly on the surface of the Moon.

Major events progressed rapidly from that point as Armstrong took pictures of the LM, gathered his contingency sample and familiarized himself with the lunar environment.

A short moon landing ceremony was conducted by the two crewmen, beginning with the unveiling of a plaque on the LM which carries the words: "Here, men from the planet Earth first set foot on the Moon July, 1969 A.D. We came in peace for all mankind."

At 10:40 p.m. Armstrong planted the flag of the United States in the lunar surface and a few minutes later President Nixon placed the first Earth-Moon telephone call, thanking the men on behalf of all Americans.

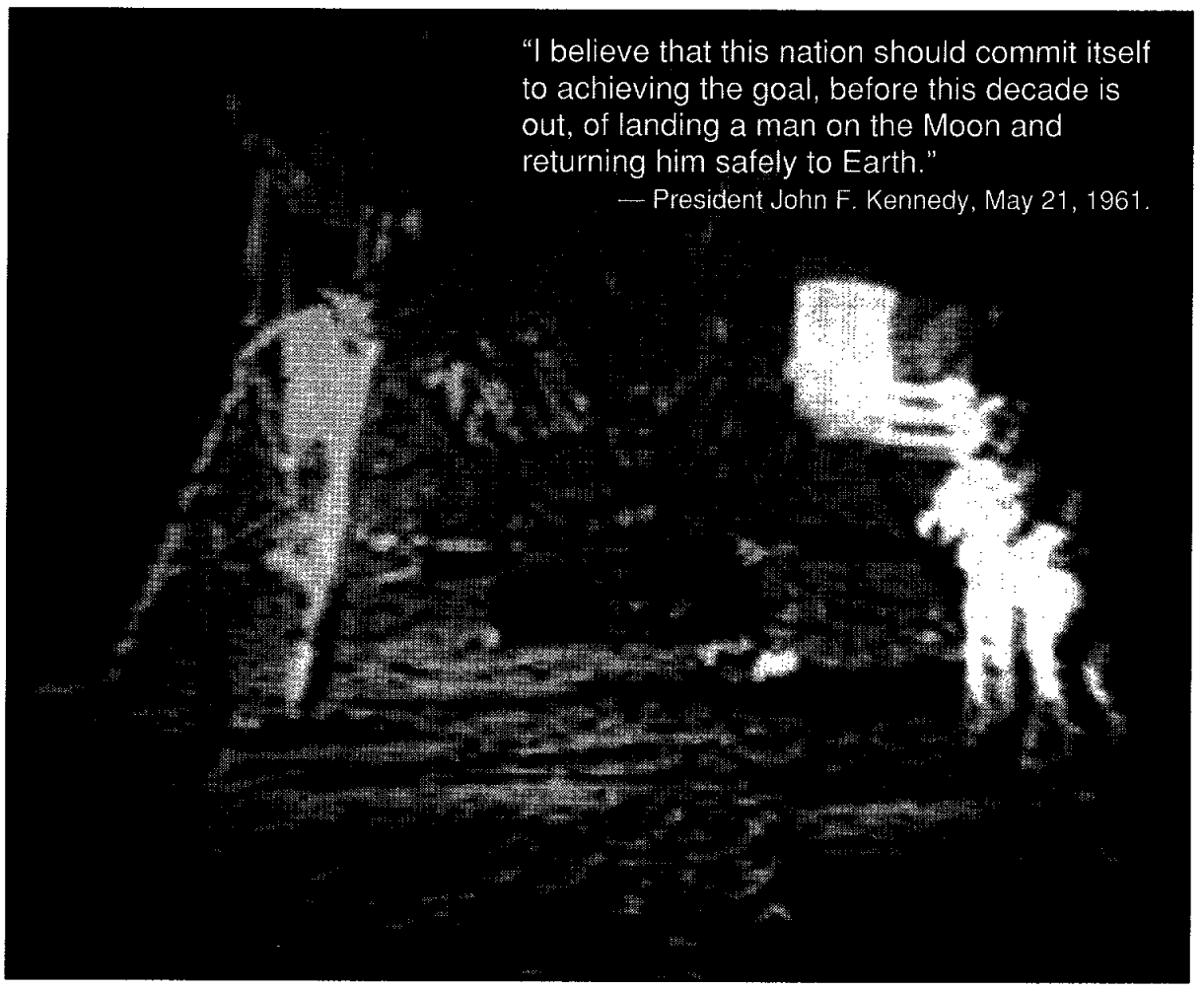
During their stay, the lunar astronauts collected about 50 pounds of bulk rock samples, about 20 pounds of documented samples and several core samples of lunar soil.

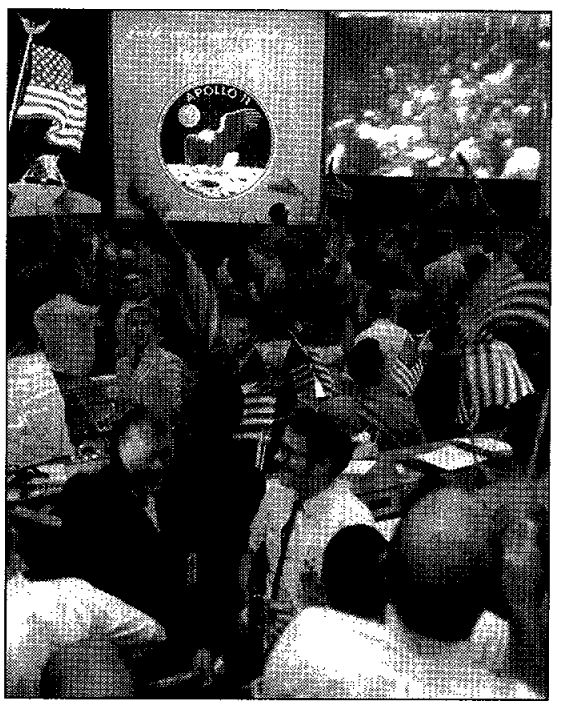
They also deployed the Early Apollo Scientific Experiments Package, containing a passive seismic experiment package and a laser ranging retro-reflector.

The crew described the area around the landing site as being covered with a fine powder which had quite a lot of cohesiveness.

Aldrin said that the rocks seemed to be slippery because of the powder. He also reported finding a purple rock similar to the types of mica found on Earth.

At 12:12 Monday morning the triumphant lunar landing crew, with sample, film, and a storehouse of personal observations, reentered the Eagle, slammed the hatch and prepared to rejoin Collins in Columbia for the trip back to Earth.





Above: Landing a man on the moon...footage transmitted to Earth from the Tranquility Base landing site shows Buzz Aldrin setting the American flag into the lunar soil on July 20, 1969...

Left: ...and returning him safely to Earth. In Houston, Mission Contol workers celebrate the conclusion of the Apollo 11 flight with the recovery of the crew July 24.

Gilruth led the way

During the Apollo 11 Post-Recovery Press Conference Thursday, July 24, 1969, George Low, manager of the Apollo Spacecraft Program Office ...cited the contribution to manned space flight by one individual...

"...there is one individual I would like to single out and say just a few words about. This is the man who started Project Mercury, who started manned space flight in this country, who led us through that with the first American manned space flights, who led us from that into Gemini with 10 successful flights where we learned how to operate in space, and who taught many of us here all we know today about how to fly men in space—and that is the Director of this Center, Bob Gilruth.

"Bob, I think I speak for all of us here in Houston and the entire country in saying that without you, the events of the past week just would not have ben possible. Thanks a lot."

Gilruth Center News

New Hours: The Gilruth Center will now remain open until 2 p.m. Saturday and close at 9 p.m. Friday.

Sign up policy: All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a yellow EAA badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304. Payment by cash or check.

EAA badges: Required for use of the Gilruth Center. Employees, spouses eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday; and 9 a.m.-2 p.m. Saturdays. Cost is $10. Dependents must be between 16 and 23 years old.

Basketball: Registration is ongoing for men's summer basketball leagues for play on Tuesday, Wednesday and Thursday evenings. Cost is $315 per team.

NASA Fitness Challenge: Runs through Aug. 31. Call x30301 for more information.

Hatha Yoga: A stress relieving, stretching and breathing exercise routine to unite body, mind and spirit. Classes meet from 5:30-6:30 p.m. Thursdays. Cost is $40 for eight weeks.

Nutrition intervention program: A six-week program to learn more about the role diet and nutrition play in health, including lectures, private consultations with a dietitian and blood analysis. Program is open to all employees, contractors and spouses. For more information call Tammie Shaw at x32980.

Defensive driving: One-day course is offered once a month. Next class is June 21. Pre-registration required. Cost is $25.

Stamp club: Meets at 7 p.m. every second and fourth Monday in Rm. 216.

Weight safety: Required courses for employees wishing to use the weight room will be offered from 8-9:30 p.m. Next class July 31. Pre-registration is required. Cost is $5. Annual weight room use fee is $90. Additional family members are $50.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is $24 for eight weeks.

Aikido: Introductory martial arts class meets from 5:15-6:15 p.m. Tuesday and Wednesday. Cost is $35 per month. New classes begin the first of each month.

Aerobics: Classes meet from 5:15-6:15 p.m. Monday, Tuesdays and Thursdays. Cost is $32 for eight weeks. Kristen Maidlow, instructor.

Ballroom dancing: Beginner classes meet from 7-8:15 p.m. Thursdays. Intermediate and advanced classes meet from 8:15-9:30 p.m. Cost is $60 per couple.

Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is $20 per couple.

Fitness program: Health Related Fitness Program includes a medical screening examination and a 12-week individually prescribed exercise program. For more information call Larry Wier at x30301.

Gilruth Home Page: Check out all activities at the Gilruth online at: http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

Loving Feelings Concert: 8 p.m. Sept. 9 at the Summit. Tickets are $38.

EAA Texaribbean Cruise: Nov. 22-30. $200 deposit per person, final payment by Sept. 15.

Astroworld: $22.75. Season pass $56.75. Multi-visit $37.50

Waterworld: $11.50.

Moody Gardens: Tickets are $9.50 for 2 of 4 events.

Space Center Houston: Adult $8.95; children (4-11) $6.40.

Seaworld: Adult $27.25; children(3-11)$18.25.

Schlitterbahn: Adult $20.25; children $17.50.

Splashtown: Adult $14.50; children (3-9) $11.50.

Movie discounts: General Cinema, $5.25; AMC Theater, $4.50; Sony Loew's Theater, $4.75.

JSC logo shirts: Polo style, $23. T-shirt, $10.

Stamps: Book of 20, $6.40.

Metro tickets: Available.

Orbit: The book *Orbit* by Jay Apt, Mike Helfert and Justin Wilkinson is on sale for $28.

JSC history: The book *Suddenly Tomorrow Came... A History of Johnson Space Center* is available for $11.

Roundup Deadlines

The Space News Roundup is published every other Friday. Story ideas should be submitted as far in advance as possible, but no later than two weeks prior to the date of publication.

The deadline for Dates & Data calendar items is three weeks prior to the date of publication.

Stories and ideas should be submitted to Managing Editor Karen Schmidt in Bldg. 2, Rm. 181, or via e-mail to karen.r.schmidt1@jsc.nasa.gov

Students experience hands-on space research

By Monica Cervantes, Lyndi Garrett

Twelve high school students are spending their summer vacation learning first hand what it is like to work at JSC.

Through JSC's Summer High School Apprentice Research Program, or SHARP, students are experiencing what it is like to have a career in science, engineering or mathematics.

"The program solidified my idea of becoming an engineer," said Thaun Nguyen, a former SHARP student and second year co-op. "Working as a SHARP student, I learned to set higher goals for myself because I worked under a very challenging environment; it also instilled upon me responsibility, dedication and the values of a good education."

As apprentices, the students learn and earn. Students are assigned a mentor and given projects to complete within the time span of eight weeks. These projects can range from constructing a computer model of the gas, water and waste management systems of the Human-Rated Regenerative Life Support Systems Test Facility to determining whether structural alterations of DNA occur after exposure to defined levels of radiation.

"It's exciting knowing that I, a high school student, have the ability to make a substantial amount of difference in NASA's on-going space exploration," said student Joseph Camp.

"While the result of the student's work is helpful to us in obtaining our research goals, I feel that our research group has benefited even more from the day-to-day interaction with a young student so interested in science," said Mentor Melody Anderson.

This year's participants are: D'Andrea Anders, Biomedical Hardware Development and Engineering Office; Joseph Camp, Avionics Systems Division; Monica Cervantes, Simulator Operations and Technology Division; Sophia Edukere, Aerospace and Flight Mechanics Division; Juliet Galvez, Crew and Thermal Systems Division; Lyndi Garrett, Vehicle Office; Charles Goff, Safety and Mission Assurance Office; Hassan Hillard, Information Systems Office; JaMail Johnson, Manufacturing, Materials, and Process Technology Division; Beverly Karhson, Advanced Developments Office; Xenia Murray, Flight Design and Dynamics Division; and Rima Patel, Medical Sciences Division.

People on the Move

Human Resources reports the following personnel changes as of July 1:

Additions

Christopher Madsen joins the Engineering Directorate as a fluid and flight mechanics engineer.

Reassignments

Lucy Ruiz moves from the Office of the Director to Engineering as a secretary. Patricia Dickson moves from the Business Management Directorate to Information Services as a support services specialist. Calvin Jackson moves to the Stennis Space Center.

Promotions

Linda Dunn and Mary Thomas were promoted to purchasing agents in the Business Management Directorate.

Resignations

Connie Hutchinson, Flight Crew Operations. Matthew Rosenthal of Mission Operations. Andrew Sylvester of Engineering.

Retirements

Keith Ulrich, Business Management Directorate, 9 years.

Deaths

Todd Breed of the International Space Station Program Office. Howard Renfro, Business Management Directorate. Terri Hesse of the Technology Transfer and Commercialization Office.

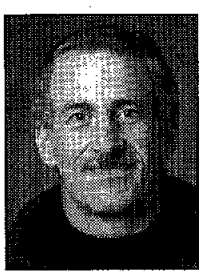
Corrections to the July 4 People on the move

Arthur Beal was promoted to supervisory engineer of research pilot-ing in Flight Crew Operations.

Ven Feng was promoted to a flight systems engineer in the International Space Station Program Office.

Charles Harris was promoted to a supervisory engineer of aerospace flight systems in the Space and Life Sciences Directorate.

Michael Manering was promoted to a technical management engineer in the Space Operations Management Office.



Hoffman

Hoffman moves to Paris

By Eileen Hawley

Veteran astronaut Jeff Hoffman is leaving the Astronaut Corps after five space shuttle flights to become NASA's European representative in Paris.

"Jeff's contributions over the past 19 years have been extremely valuable to the astronaut corps, and we will certainly miss him," said Dave Leestma, director of Flight Crew Operations. "We are pleased that he will continue to provide his expertise to the agency in his new role."

Hoffman was selected as an astronaut in 1978. On STS-51D in April 1985, he made the first contingency space walk of the space shuttle era, attaching a 'fly-swatter' device to the shuttle's robot arm in an attempted rescue of the Leasat satellite. He then flew on STS-35, a dedicated astronomy mission in December 1992 onboard *Columbia*. He was the payload commander for STS-46, the first flight of the Tethered Satellite System in July 1992, and flew again on STS-75 in March 1996 for the Tethered Satellite reflight. Hoffman also was one of four space walking astronauts for the first Hubble Space Telescope servicing mission in 1993 during the STS-61 mission. In his five space flights, Hoffman has logged more than 1,200 hours in space and traveled more than 21.5 million miles.

In his new position, Hoffman will be responsible for monitoring the implementation of NASA policies and relationships with the European space and aeronautical communities, as well as governmental, industrial and academic institutions.

Employees earn top honors

JSC employees were honored July 15 to receive NASA's highest awards.

Each recipient of a NASA medal was presented with a framed certificate signed by NASA Administrator Daniel S. Goldin. Individuals selected to receive Group Achievement Awards on their team's behalf received a framed certificate at the ceremony. JSC Director George Abbey made the presentations with the assistance of Deputy Administrator Gen. John R. Dailey.

The following individuals received awards.

Senior Executive Service Meritorious Executive Award

Harvey Hartman, Henry Hartsfield, Tommy Holloway and Sam Pool.

NASA Distinguished Service Medal

Tom Akers, Jay Apt, John Casper, Franklin Chang-Díaz, Tom Henricks, Jeff Hoffman, Tammy Jernigan, Shannon Lucid, and Story Musgrave.

NASA Outstanding Leadership Medal

John Aaron, Andy Allen, John Beall, Doug Blanchard, Jack Boykin, Randy Brinkley, Kevin Chilton, Ken Cockrell, Doug Cooke, Ron Dittemore, Brian Duffy, Randy Gish, Susan Helms, James Hickmon, Elric McHenry, Bill Readdy and Ron Sega.

NASA Exceptional Scientific Achievement Medal

Everett Gibson, David McKay and Kathie Thomas-Keprta of Lockheed Martin.

NASA Exceptional Service Medal

Pleddie Baker, Curtis Brown, Daniel Bursch, Mary Chesler, Leroy Chiao, Michael Clifford, Diane Costello, Margaret Coward, Stanley Donahoe, Heibert Epps, Richard Fullerton, Marc Garneau, Linda Godwin, John Grunsfeld, Bernadette Hajek, Richard Jones, Tom Jones, Jessica Kite, Vickie Kloeris, Kevin Kregel, Arnold Levine, Ladonna Miller, Rhonda Moore, Claude Nicollier, Ellen Ochoa, William Parkan, Barbara Pearson, Ken Rominger, Mario Runco, Richard Searfoss, Daniel Sedej, Dan Tam, Sharon Thomas, James Van Laak, Carl Walz, Terry Wilcutt, Ronald Williams and Kenneth Wong.

NASA Exceptional Achievement Medals

John Breitenbach, Linda Bromley, Edgar Castro, Bernestine Dickey, John Hooper, Burt Laws, Michelle MacFadyen, Lili Moore, Larry Neu, Donald Noah, Julie Pate, Bernard Rosenbaum, Karl Schuler, and Steven Swanson.

NASA Public Service Medals

Louis Cazes of Lockheed Martin, Mike Gentry of Information Dynamics Inc., Charles Reinhartsen of the Clear Lake Economic Development Foundation, John Schuessler of McDonnel Douglas, David Short of Baylor College of Medicine and Bill Taylor of Information Dynamics Inc.

NASA Group Achievement Award

Extravehicular Activity Development Flight Test Program Team, Global Positioning System Attitude and Navigation Experiment Team, Orbiter Light Weight Seat Project Team, Orbiter Operations Maintenance Requirements and Specification Document Review Team, Russian Negotiations Team for Space Station, Space Flight Operations Contract Acquisition Team Space Station Common Berthing Mechanism Thermal Vacuum Test Fixture Manufacturing Team, T-38 Inlet Redesign Team, White Sands Test Facility Chargeback Team and White Sands Test Facility Depot Operations Group.

NASA Public Service Group Achievement Award

Lockheed Martin Aircraft Simulation and Information Systems – Lockheed Martin, Mission Control Center Emergency Power Building Operating Team–Brown and Root Services/ Pioneer, and Sonny Carter Training Facility Neutral Buoyancy Laboratory Development Team–McDonnell Douglas Aerospace.

Frequent flyer accounts move from travel office

Employees who are enrolled in JSC's frequent flyer program will now have access to accounts within their own offices.

For a number of years, the Travel Office has maintained a centralized file. The program was initiated as a cost-saving tool and more than 1,200 employees are enrolled.

"Due to the effort required to maintain a centralized program and our limited available resources and at the request of a major directorate, employee accounts will be transferred to the individual directorates," said Center Operations Director Jim Hickmon. "Each directorate may choose to maintain their own system or distribute the accounts to the individual employees."

The Travel Office will work with travel coordinators to ensure the transition of accounts is accurate and complete. Employees should note that this change in procedure in no way changes the rules for use of frequent flyer benefits gained as a result of government travel.

Frequent travel benefits earned in connection with official travel may be used only for official travel. Employees may not retain and use such benefits for personal travel.

Questions concerning the transition should be directed to Rose Gardner-DeLapp at x30331.

Dates & Data

July 19

NTA meets: The National Technical Association will meet at 10 a.m. July 19 at Texas Southern University School of Technology, Rm. 316. For more information call Pam Denkins at x35272.

July 23

Spaceland Toastmasters meet: The Spaceland Toastmasters will meet at 7 a.m. July 23 at the House of Prayer Lutheran Church. For more information, call Jeannette Darcy at x45752.

Communicators meet: The Clear Lake Communicators will meet at 11:30 a.m. July 23 at the Lockheed Martin, 555 Forge River Road. For more information, contact Richard Lehman at (281) 538-1854.

Spaceteam Toastmasters meet: The Spaceteam Toastmasters will meet at 11:30 a.m. July 23 at United Space Alliance, 600 Gemini. For details, call Pat Blackwell at (281) 282-4302.

Astronomy seminar: The JSC Astronomy Seminar will meet at noon July 23 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For more information, contact Al Jackson at x35037.

July 24

Hurricane chat: The Emergency Operations Center will host a hurricane chat at 6 p.m. July 24 at the Celebrity Chat room located at http://chat.storm97.com/cgi-bin/echat/login Robert Sheets, former director of the National Hurricane Center will be the featured expert. For more information call Bob Gaffney at x34249.

July 31

Radio club meets: The JSC Amateur Radio Club will meet at 7 p.m. July 31 at Piccadilly Cafeteria, 2465 Bay Area Blvd. For details call Larry Dietrich at x39198.

Aug. 8

Astronomers meet: The JSC Astronomical Society will meet at 7:30 p.m. Aug. 8 at the Lunar and Planetary Institute, 3600 Bay Area Blvd. For more information call Chuck Shaw at x35416.

Aug. 12

Aero club meets: The Bay Area Aero Club will meet at 7 p.m. Aug. 12 at the Houston Gulf Airport clubhouse at 2750 FM 1266 in League City. For more information call Larry Hendrickson at x32050.

Aug. 13

MAES meets: The Society of Mexican American Engineers and Scientists will meet at 11:30 a.m. Aug. 13 in Bldg. 13, Rm. 156. For more information call G.D. Valle at x38835.

PSI meets: The Clear Lake/ NASA Area Chapter of Professional Secretaries International will meet at 5:30 p.m. Aug. 13 at the Holiday Inn, NASA Road 1. Dinner costs $15. For more information call Elaine Kemp at x30556.

Aug. 14

Airplane club meets: The Radio Control Airplane Club will meet at 7:30 p.m. Aug. 14 at Clear Lake Park Community Bldg. For more information call Bill Langdoc at x35970.

Aug. 18

Quality talk: The Victoria Group will host a quality seminar at 8 a.m. Aug. 18 at the Silver Moon Cafe at Space Center Houston. ISO 9000 Director Lee Norbraten will be the featured speaker. Reservations are due Aug. 4. For reservations and information call 1-800-845-0567.

Aug. 20

Scuba club meets: The Lunarfins will meet at 7:30 p.m. Aug. 20 at the Redfish Restaurant under the Kemah/Seabrook bridge, Seabrook side. For more information call Fred Toole at x33201.

Aug. 21

Directors meet: The Space Family Education board of directors will meet at 11:30 a.m. Aug. 21 in Bldg. 45, Rm. 712D. For more information on this open meeting call Gretchen Thomas at x37664.

Aug. 23

Open house: JSC will open its doors to the public from 9 a.m.-4 p.m. Aug. 23. For more information call John Lawrence at x35111.

Sept. 8

Thermal and fluids workshop: The Engineering Directorate will host the eighth annual Thermal and Fluid Analysis Workshop from Sept. 8-13 at the University of Houston Clear Lake. For more information call Carlos Ortiz at x38879.

News Briefs

Discovery rolls to launch pad

Discovery is on the launch pad at Kennedy Space Center after being moved Monday, July 14, for final preparations for STS-85, a mission to deploy and retrieve the CRISTA-SPAS science satellite. STS-85 Commander Curt Brown, Pilot Kent Rominger, Mission Specialists Jan Davis, Bob Curbeam and Stephen Robinson, and Payload Specialist Bjarni Tryggvason will travel to Florida for the Terminal Countdown Demonstration Test July 22-23. NASA managers will conduct the STS-84 Flight Readiness Review July 24.

Meanwhile, *Atlantis* continues its processing in the Orbiter Processing Facility for mid-September's STS-86 mission to Russia's Mir Space Station to deliver Wendy Lawrence and supplies to the station and return Mike Foale from his four-month stay.

NASA licenses air monitoring technology

A technology originally developed for monitoring atmospheric air quality now is being used to help U.S. industries reduce smokestack pollution. NASA's Langley Research Center is working with MERCO Inc. of Golden, Colo., to develop fast-response, nonmechanical, remote gas-sensing technology for monitoring gaseous pollutants emitted from petroleum refineries and chemical manufacturing facilities.

NASA adjusts to loss of ADEOS satellite

Two NASA instruments were aboard the ADEOS spacecraft, which was declared lost on June 30 by the National Space Development Agency of Japan. NASA's two instruments—the Ozone Mapping Spectrometer and the NASA Scatterometer—were lost. Because the scatterometer provided measurements that will be needed over the long term, NASA was already developing a second instrument. That instrument, called SeaWinds, will be delivered to NASDA for integration next April and is scheduled for launch in 1999 on ADEOS II.

Mars Global Surveyor enroute to Mars

Two weeks after recovery from safe mode and the restoration of standard operations, the Mars Global Surveyor continues to cruise toward an encounter with Mars later this summer. Surveyor is 137.88 million kilometers from the Earth, 24.04 million kilometers from Mars and will intercept Mars on Sept 11.

Asteroid Mathilde reveals dark past

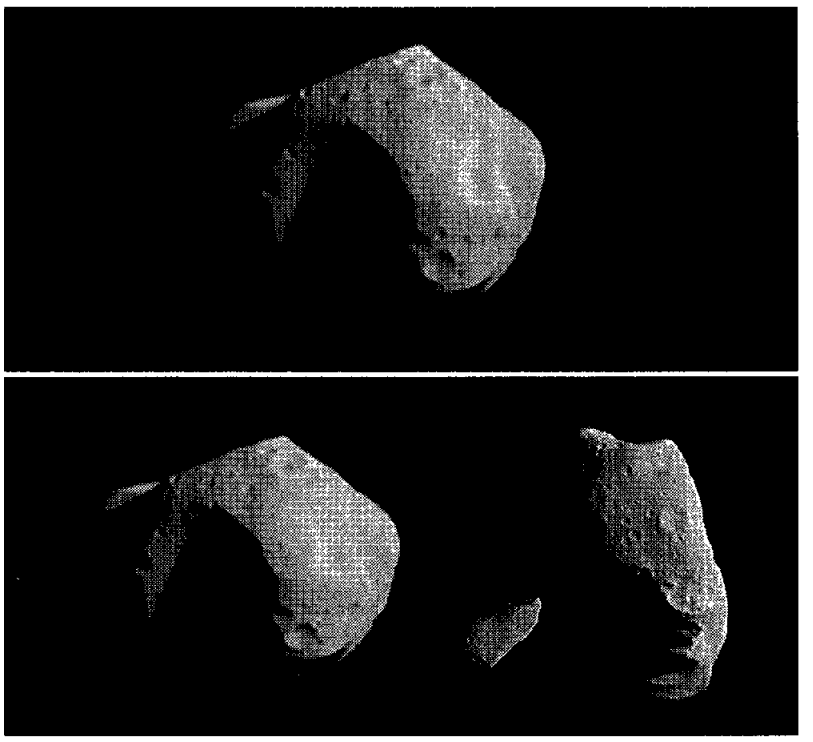
More than 100 years after its discovery, asteroid 253 Mathilde is sharing its secrets with scientists at Johns Hopkins University.

A 25-minute flyby of the asteroid by the Near Earth Asteroid Rendezvous, or NEAR, spacecraft on June 27 has resulted in spectacular images of a dark, crater-battered little world assumed to date from the beginning of the solar system.

The Mathilde flyby is the closest encounter with an asteroid to date and the first with a C-type asteroid. The asteroid's mean diameter was found to be 33 miles, which is somewhat smaller than researchers originally estimated. A study of the asteroid's albedo (brightness or reflective power) shows that it reflects three percent of the sun's light, making it twice as dark as a chunk of charcoal. Such a dark surface is believed to consist of carbon-rich material that has not been altered by planet-building processes, which melt and mix up the solar system's original building block materials.

"The Mathilde encounter was one of the most successful flybys of all time," says Robert Farquhar, of the Applied Physics Laboratory at Johns Hopkins, who serves as the NEAR mission director. "We got images that were far better than we thought possible, especially since the spacecraft was not designed for a fast flyby."

Although Mathilde proved to be rounder than asteroids such as Gaspra and Ida, Joseph Veverka of Cornell University, who leads the mission's imaging science team, says, "Mathilde turned out to be more irregularly shaped than most of us expected. The degree to which the asteroid has been battered by collisions is astounding. At first glance there are more huge craters than there is asteroid."



Top: This image mosaic of asteroid 253 Mathilde is constructed from four images acquired by the NEAR spacecraft on June 27. This was taken from a distance of 1,500 miles. The surface has large craters, including the deeply shadowed one at its center, which is estimated to be more than 6 miles across. Below: Mathilde, left, measures 33 miles in diameter, much larger than asteroids Gaspra, center, and Ida, right.

New handbook to be available electronically

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"What employees need to remember is that the new benefits statement is somewhat like the Sunday paper," Stewart said. "Some days you'll want to read the paper from cover to cover, other days maybe just the comics or the want ads. With the benefits statement , the disability sections may not seem important to you this morning ...but hurt your back tonight and you'll probably be real interested in your disability coverage. The important things to remember are that there are many benefits available to you and that when you need it , you can receive an up-to-date summary of these benefits within moments of your request."

Stewart said the statements contain more than 200 data elements or calculations that are unique to each employee. Since each of these elements would be hard to explain in the statement, a companion chapter in the new benefits handbook was developed. The new handbook complements the statement by giving an explanation of each element of the benefits statement. Stewart said that he is sure that continuing customer feedback will help them to continuously adjust the statement to meet changing employee needs.

"The new employee benefits handbook will be available electronically with updates occurring real-time," Stewart said. "It replaces the old binder-type handbook that required annual paper updates. The book, like the new statement, is intended to be useful throughout an entire career and encompasses a whole lot more in an easy to read, easy to update format."

The handbook not only gives details about each section of the statement but important contacts, recurring open season dates and a quick-look guide to employees' pay and benefits.

Employees can expect their statements to arrive by the end of this month. The JSC benefits handbook should be available on the Human Resources home page at: http://www.hro.jsc.nasa.gov by early August.

Although the handbook will primarily be distributed electronically, Employees can obtain a hard copy by calling x32681 or by visiting Bldg. 45, Rm. 140.

STS-94 pushing envelope of scientific knowledge

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"We've completed over 165 already and we're not done yet, so I think we're getting over 110 percent of our science output."

He cited similar progress in the materials science world.

"We're processing a lot of semiconductor materials and other new metallic materials, metallic glasses that have other technological applications, so we have a lot of breakthroughs we're working on here," Thomas explained. "It might be a few years before they find their way into everyday life down on Earth, but this is basic research and we're pioneering out here."

Investigators on the ground said the Microgravity Science Laboratory-1 mission was pushing the envelope of knowledge of combustion, setting a fire at extremely low atmospheric pressures and giving birth to twin droplets of flame.

The morning of July 12, Linteris succeeded in burning a drop of heptane fuel at one-quarter of the atmospheric pressure on Earth. The Droplet Combustion Experiment was providing researchers with fundamental knowledge of the burning process, verifying a complex, chemical model that may lead to cleaner and safer ways to burn fuels.

"It was a superior burn," said Fred Dryer of Princeton University. "This is the first time we've been successful with a quarter-atmosphere burn. It's always hard to do science at extremities."

On July 13, researchers in the Spacelab Mission Operations Control Center set an all-time record for the number of commands issued to experiments aboard a Spacelab mission when the 25,838th science command was sent to the shuttle, breaking a 1994 record.

Crew members also worked with the Structure of Flame Balls at Low Lewis-number, or SOFBALL, experiment that looks at how fuel/oxidizer concentrations and temperature affect the flameball's stability and existence.

JSC Photo 97-08077 by Steve Candler

TAKING A DIP—Tolman Services' Gerry Stahler sweeps algae into a drain the JSC pond. Heat and heavy rain around JSC contributed to the growth on the surface of the pond of the unsightly green organisms.

Space News ROUNDUP

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Rover performing well; rock studies under way

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presence of oxidized iron in surface materials.

"The surface of Mars is rusting," said Jim Bell of Cornell University. "We don't know when or how fast it's rusting, but we hope to find these things out."

Rather than identifying the rocks with a numbering system, JPL scientists named them after cartoon characters.

"It's easier than saying that rock over there with the little things on it," Golombeck said. "The idea to use the names is really to help us refer to the rocks among ourselves, and if you can have a little fun with it, why not?"

Other rocks to be studied include Yogi, Flattop and Casper. More than a dozen rocks have been identified with more expected.

The first specimen analysis, of a rock named Barnacle Bill some 14 feet from the landing site, went well as the rover's drivers nuzzled the microwave-sized vehicle against its surface and found it remarkably similar to rocks found on Earth.

The trip to the next target also went well until Sojourner was directed to move a bit too fast and began climbing up the side of a large, bear-shaped rock as it tried to place its probe against the specimen, nicknamed Yogi.

"It just went without thinking," said Mission Manager Richard Cook. "When you tell it to move, it moves faster than when it moves on its own. So that is why we missed it."

The rover was undamaged by the collision, but ended up repeating it the next day when the control team at NASA's Jet Propulsion Laboratory sent instructions for backing away and returning twice, thinking the rover hadn't received the first set of instructions when it had.

Pathfinder landed just after noon CDT on Friday, July 4, successfully entering the Martian atmosphere, deploying its parachutes, and bouncing 16 times before coming to rest near Ares Vallis chasm.

On Earth, the Pathfinder scientists burst into cheers as the first transmissions from the lander reported that the craft was healthy and performing as planned.

"I am ecstatic, absolutely ecstatic to report on behalf of the entire Mars Pathfinder team that we are on the surface of Mars and we are receiving the first telemetry from the spacecraft," said Pathfinder Project Manager Brian Muirhead. "This is way beyond our expectations."

"What a way to celebrate the Fourth of July, by doing things that have never been done before. This is what NASA is about," said JPL Director Ed Stone.

The lander bounded onto the Martian surface at 23.5 miles per hour, protected by four air bags that inflated during the atmospheric decent. When the craft came to a stop, the air bags deflated and retracted, leaving a metallic tetrahedron containing the Sojourner rover exposed to the Martian terrain.

Pathfinder scientists said the rover is performing well and should easily outlive its minimum life expectancy of seven days, possibly continuing its prospecting for up to a month.