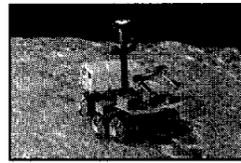


A new soil developed at JSC has nutrient capacity for several crops. Story on Page 3.



NASA scientists and students get a chance to remotely explore Hawaii's volcanos. Story on Page 4.

Space News Roundup

Vol. 34

February 17, 1995

No. 7

NTV changes to better serve media, public

Americans in hometowns around the country may soon be saying "I want my NTV!" as big changes take hold on NASA Television.

NTV is taking an innovative approach to meet the needs of its news media customers and reach out to millions of Americans.

The changes will allow news media, educators and the public to use NTV as an information resource rather than a programming cable or TV channel. Raw information in the form of original, unedited footage will be broadcast as an information service to the news media and the public, as well as to all NASA centers.

"NASA Television is a tool we can use to talk directly to millions of Americans," said Joe Benton, executive producer.

NTV's satellite also is being used for live interviews that reach specific, targeted audiences. During STS-63, on rendezvous day, Astronaut Greg Harbaugh was interviewed by 11 different TV stations nation-wide over a period of two hours. The interviews were part of the local live newscasts, bringing to millions of Americans the details live of Mir rendezvous.

"The initial response to this approach has been absolutely astounding," said Jeff Carr, acting director of public affairs. "In our first trial experiences we reached more than 20 million households."

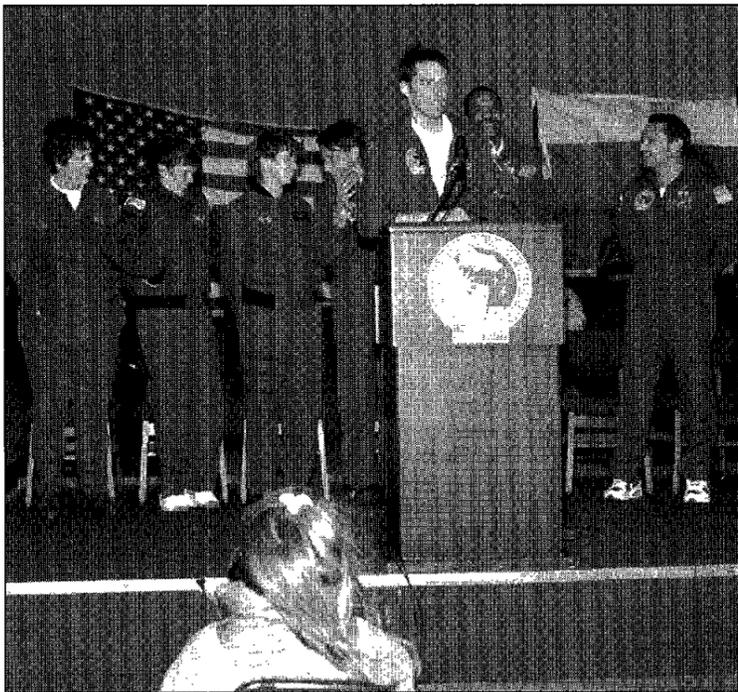
In addition to mission and special event coverage, everyday programming also has changed.

The NTV Video File airs daily at 11 a.m., and 2, 5 and 8 p.m. JSC time and accompanies NASA press releases with sound and images.

The NTV Education File, airing at noon, 3, 6 and 9 p.m., shows live and taped programs designed to reach teachers and students.

And NASA in History, which airs at 1, 4, 7 and 10 p.m., shows productions keyed to the agency milestones.

NTV is now a versatile communications tool, said Carlos Fontanot, audio/visual team lead in PAO's News and Media Services Branch. It's a more agile, responsive system that better serves commercial and cable television programmers, he added.



JSC Photo by Benny Benavides

STS-63 Commander Jim Wetherbee speaks to friends, family members and coworkers during a welcome home ceremony on a chilly Saturday afternoon at Ellington Field. Behind him, from left, are JSC Director Dr. Carolyn L. Huntoon, Mission Specialist Janice Voss, Pilot Eileen Collins, and Mission Specialists Mike Foale, Bernard Harris and Vladimir Titov. The astronauts thanked their families and coworkers for exceptional support throughout their training and the historic rendezvous mission. "I would love to talk to you in the next few weeks and tell you what it was like to see Mir," Wetherbee said. "It was just incredible, spectacular. We think this agency is on the right track working together."

JSC forum celebrates Black History Month

Several high-profile speakers will highlight JSC's observance of 1995 National Black History Month and its theme of "Affirmative Action and Beyond."

A forum is scheduled from 11 a.m.-1 p.m. Feb. 24 at the Gilruth Center. The forum will allow JSC employees to question prominent Afro-Americans within the JSC and Houston communities and become aware of affirmative action activities and plans for the future.

Guest panelists include Dan Tam, business manager of the Space Station Program Office; Debra Johnson, manager of the Inform-

ation Systems Business Management Office; Justin Robinson Jr., Houston city council member at large; Doris Ellis, publishing editor for the Houston Sun; and Juluette Bartlett Pack, president of Texas Black Americans for Life.

The host of the forum is disc jockey J.D. Houston from radio station KHYS 98.5 and will include a welcome from JSC Director Dr. Carolyn L. Huntoon.

All JSC civil service and contractor employees are invited to attend as their workloads permit. For more information, call the Equal Opportunity Programs Office at x34831.

Rendezvous crew celebrates flight's success

Swooping in at dawn, *Discovery's* astronauts returned to Earth on Saturday, gliding to a landing just before sunrise at the Kennedy Space Center after a historic eight-day mission.

With a glimmer of daylight surrounding their landing site, Commander Jim Wetherbee and Pilot Eileen Collins guided *Discovery* to a textbook touchdown at the KSC Shuttle Landing Facility at 5:51 a.m. CST to wrap up a 2.9 million mile mission highlighted by the first rendezvous and flyaround inspection of the Russian Space Station Mir.

"Welcome home and congratulations on an outstanding mission. You all did a terrific job up there," spacecraft communicator Brent Jett radioed Wetherbee as *Discovery* rolled to a stop on the three-mile-long concrete runway. The homecoming took place 11 years to the day after *Challenger* made the first landing at the Kennedy Space Center to complete STS-41B.

At a news conference at KSC several hours after landing, Wetherbee said the Feb. 6 rendezvous of Mir was the clear highlight of his career and a personal thrill.

"A fleeting thought would enter your mind (during the rendezvous)," Wetherbee said. "How could we be doing this?"

"I think we're on the right road. This agency is going places and we're doing it with Russians and it's the right thing to do," the commander added.

Discovery's homecoming occurred after the astronauts retrieved the SPARTAN astronomy satellite in the early morning hours on Feb. 9, just minutes before Payload Commander Bernard Harris and Mission Specialist Michael Foale began a 4 1/2 hour spacewalk to test the characteristics of thermal improvements to extrave-

hicular mobility units and the astronauts ability to manipulate large objects in weightlessness.

Foale and Harris were hoisted above *Discovery's* cargo bay by Russian cosmonaut Vladimir Titov while anchored to the end of the shuttle's 50-foot long robot arm and were kept in the cold above the bay for about 20 minutes.

"Just beautiful, beautiful, beautiful," said Harris, as he gazed at the Earth some 200 miles below.

After bidding their time pointed toward deep space above the shuttle's cargo bay, the astronauts were lowered toward the SPARTAN satellite, where Foale manually unberthed the astronomy probe and passed it off to Harris. From there, Harris grabbed special handles on the satellite and moved it back and forth, testing his ability to control a massive object while mounted to a foot restraint on the side of the payload bay.

The spacewalk enabled Foale and Harris to gather valuable data about the extremes of the cold of deep space and its effect on astronauts who may be called upon to conduct lengthy construction work in the assembly of space station components in orbit. About three hours into the exercise, Foale reported he was beginning to feel the effect of the exposure to the hostile temperatures.

"My fingers feel as if they've been put in liquid nitrogen," Foale reported.

"I guess we put you in the deep freeze today," quipped Collins, who orchestrated the space walk from *Discovery's* aft flight deck.

Playing it conservatively, flight director Phil Engelauf elected to delete Foale's mass handling task with the SPARTAN satellite and an attempt by Titov to move Foale up

Please see STS-63, Page 4



Endeavour crew practices launch for 15-day mission

Engineers at the Kennedy Space Center continue to prepare *Endeavour* for its launch around March 2 on the STS-67/Astro-2 mission.

The seven astronauts who will fly the record-setting 15 1/2 day mission, led by Commander Steve Oswald, conducted the traditional dress rehearsal for their launch Wednesday.

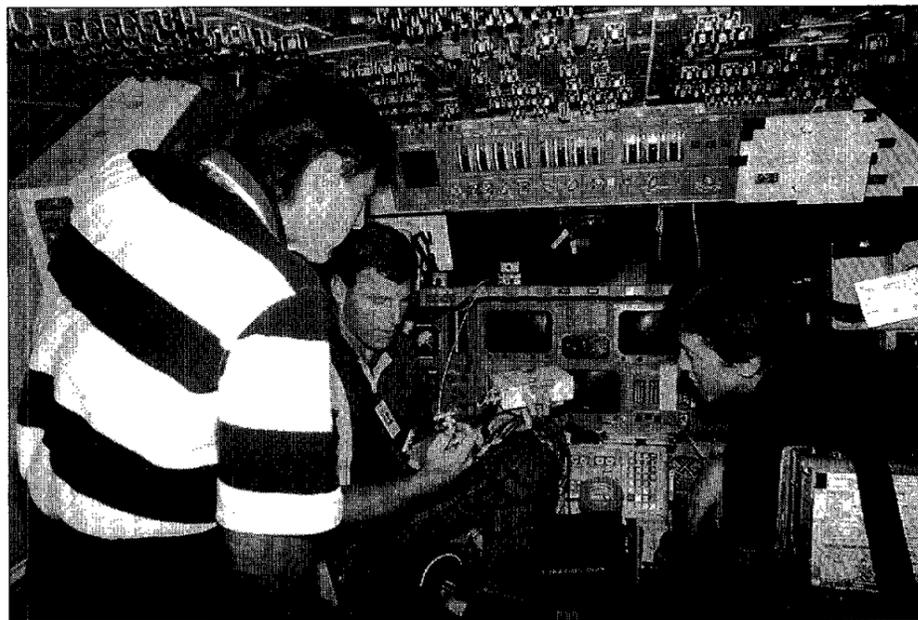
Pilot Bill Gregory, Payload Commander Tammy Jernigan, Mission Specialists John Grunsfield and Wendy Lawrence and Payload Specialists Ron Parise and Sam Durrance joined Oswald in climbing aboard *Endeavour* for the final hours of a simulated countdown.

As they did, NASA managers met at KSC to set a firm launch date in early March for the second shuttle mission of the year.

Astro-2 will use three unique instruments—the Hopkins Ultraviolet Telescope, the Ultraviolet Imaging Telescope and the Wisconsin Ultraviolet Photo-Polarimeter Experiment—to collect ultraviolet measurements of the universe, supplementing data collected on the first Astro flight in 1990.

Working around the clock, the crew will monitor the

Please see ENDEAVOUR, Page 4



JSC Photo by Andrew Patnesky

STS-67 Payload Specialist Sam Durrance, left, works with Commander Steve Oswald and Mission Specialist Wendy Lawrence during a training session in the Crew Compartment Trainer in Bldg. 9. The crew participated in the terminal countdown demonstration test this week at Kennedy Space Center. Astro-2 will use three unique instruments—the Hopkins Ultraviolet Telescope, the Ultraviolet Imaging Telescope and the Wisconsin Ultraviolet Photo-Polarimeter Experiment—to collect ultraviolet measurements of the universe.

JSC to picnic at Astroworld

The results of an Employee Activities Association survey are in, and by a wide margin employees asked for the annual family picnic to be held at Astroworld.

The picnic is scheduled from 11 a.m.-8 p.m. April 22 at the A&W Ranch inside Astroworld.

The A&W Ranch will be designated for JSC and contractor employees only and will include all-you-can-eat barbecue, bingo and other coordinated activities.

Tickets will cost \$11 per person for everyone over the age of 3. The tickets include the barbecue dinner, all Astroworld rides and attractions, and a special "free" ticket to return to the park at another time.

Tickets go on sale at the Exchange Store on March 27. The \$11 price is limited to the first 3,000 tickets sold. After that, the price will be \$20. Astroworld season ticket holders may purchase a ticket for \$6 and receive all the benefits of the regular JSC ticket.

For more information call the Exchange Store at x35350.

JSC

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.

Musical concerts: Les Miserables at 2 p.m. March 26 at the Wortham Center. Tickets cost \$42. Tickets on sale through Feb. 10. Cats at 8 p.m. April 14 at Jones Hall. Tickets cost \$36. Tickets on sale through March 10. Miss Saigon at 8 p.m. July 21 at Jones Hall. Tickets cost \$58. Tickets on sale through March 8.

Ice hockey: Houston Aeros vs. Orlando at 8:30 p.m. March 2 at the Summit. Tickets cost \$16.50. On sale through Feb. 24. Houston Aeros vs. Las Vegas at 8 p.m. March 4 at the Summit. Lower level tickets cost \$11. On sale through Feb. 22. Houston Aeros vs. Milwaukee at 7 p.m. March 25 at the Summit. Lower level tickets cost \$11. On sale through Mar. 15.

Symphony: The Clear Lake Symphony will perform at 8 p.m. Feb. 18 at University of Houston Clear Lake. Tickets cost \$5 for adults and \$3 for seniors and students. Tickets on sale through Feb. 17.

Rodeo tickets: Some performances are still available. Tickets cost \$9.50.

Moody Gardens: Discount tickets for two of three different attractions: \$9.50

Space Center Houston: Discount tickets: adult, \$8.75; child (3-11), \$7.10.

Metro tickets: Passes, books and single tickets available.

Movie discounts: General Cinema, \$4.75; AMC Theater, \$4; Loew's Theater, \$4.75.

Stamps: Book of 20, \$6.40.

JSC history: *Suddenly, Tomorrow Came: A History of the Johnson Space Center.* Cost is \$11.

Upcoming events: Houston International Festival from April 20-30. Tickets cost \$3.

JSC

Gilruth Center News

Sign up policy: All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a NASA badge or yellow EAA dependent 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.

EAA badges: Dependents and spouses may apply for photo identification badges from 7 a.m.-9 p.m. Monday-Friday; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

Weight safety: Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. Feb. 23 and March 14. Pre-registration is required. Cost is \$5.

Defensive driving: Course is offered from 8:15 a.m.-3 p.m. Saturday. Next class is March 4. Cost is \$19.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays.

Aikido: Martial arts class meets from 5-7 p.m. Tuesdays and Wednesdays. Cost is \$25 per month. New classes begin the first of each month.

Tennis league: Registration for the spring tennis league will be held Feb. 6-10. Cost is \$25. Contact the Gilruth Center at x33345.

Country dancing: Beginners class meets from 7-9 p.m.; advanced class meets from 8:30-10 p.m. Partners are required. For additional information, contact the Gilruth Center at x33345.

Ballroom dancing: Ballroom dancing classes. Cost is \$60 per couple. For additional information call the Gilruth Center at x33345.

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

JSC

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Ads may be run only once. Send ads to Roundup Swap Shop, Code AP2, or deliver them to the deposite box outside Rm. 181 in Bldg. 2. No phone or fax ads accepted.

Property

Rent: Galveston condo, furn, sleeps 6, Seawall Blvd & 61st St, wkend/wkly/daily rates, Mardi-Gras special \$199/wkend. Magdi Yassa, 333-4760 or 486-0788.

Sale: Cemetery, S Memorial Park, 6 lots, \$1k/ea. Johnson, 488-5010.

Sale/Lease: Waterview condos, 3-2, W/D hk up, 1400 sq ft, \$59k/purchase. 326-2221.

Sale/Lease: 2100 sq ft townhouse, Landing Condos, 4445 NASA 1. 326-2221.

Rent: Breckinridge, Co, house, 4-3 loft, sleeps 12, panoramic views. 303-482-9124.

Sale: Friendswood, 4-2-2, corner cul-de-sac, fenced yard. Virginia, 996-1711.

Rent: El Dorado Trace, 2-2, furn, W/D, FPL, TV/VCR, \$675 + elec. 333-8126 or 488-1327.

Sale: Property, 1.9 acs, Point Blank, TX, 7 min from Lake Livingston. 326-2307.

Sale: '94 Fleetwood mobile home, 14' x 70', 2-2 w lot, near Alvin, TX. 380-0408.

Sale: LC, 3-2-2, Bayridge brick, A/C, ceiling fans, lg yard, \$55k/obo. 286-1934.

Sale: Baywind I, 2-1.5-2, condo, W/D, new dishwasher & disposal, immed occup, financing available, \$29k. 333-3992.

Rent/Sale: Egret Bay waterfront condo, 1-1, FPL, fans, W/D, dishwasher, micro, \$530/mo + dep. Karl, x33031 or 334-1164.

Lease: Clear Lake Shores, house, 2-2-1, furnished, \$1k/mo. Corcoran, 334-7521.

Rent: Arkansas cabin overlooking Blue Mt Lake, furn, \$250/wkly or \$50/dly. Corcoran, x33005 or 334-7531.

Rent: Condo, Winter Park, Co, 2-2, furn, sleeps 6, spring break available. 488-4453.

Lease: Baywind 1 condo, upstairs, 2-1.5-2, appl, W/D, C/F, new paint/carpet, \$500/mo + dep. Lachman Das, x33235 or 488-5532.

Rent: Condo, Winter Park, Co, 2-2, furn, sleeps 6, spring break available. 488-4453.

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JSC

Dates & Data

Today

Cafeteria menu: Special: tuna noodle casserole. Total Health: broiled chicken breast. Entrees: deviled crabs, broiled pollock, liver and onions, broiled chicken with peach half, Reuben sandwich. Soup: seafood gumbo. Vegetables: Italian green beans, cauliflower au gratin, steamed rice, vegetable sticks.

Monday

Presidents Day: Most JSC offices will be closed Monday in observance of the Presidents Day holiday.

Tuesday

Speech contest: The Loral Chapter of the National Management Association will host the opening round of the American Enterprise Speech contest for high school students beginning at 5:30 p.m. Feb. 21 at South Shore Harbour Country Club. For additional information call Mary Jane Powell at 282-7781.

Cafeteria menu: Special: spaghetti with meatballs. Total Health: baked potato. Entrees: stir fry beef, liver and onions, beef cannelloni, ham steak French dip sandwich. Soup: split pea. Vegetables: winter blend mix, seasoned cabbage, breaded squash, lima beans.

Wednesday

Logistics symposium: The American Institute of Aeronautics and Astronautics and the Society of Logistics Engineers will host the sixth Space Logistics Symposium from Feb. 22-24 at the South Shore Harbour Resort. For additional information call Steve Zobel at 244-4231.

Astronomy seminar: The JSC Astronomy Seminar will meet at noon Feb. 22 in Bldg. 31, Rm. 129. Dr. Robert Herrick will discuss various uses of the cratering record on Venus. For more information, call Al

Jackson at 333-7679.

Toastmasters meet: The Space-land Toastmasters meets at 7 a.m. Feb. 22 at House of Prayer Lutheran Church on Bay Area Blvd. For additional information, contact Darrell Boyd, x36803.

Bike ride: The JSC Bicycle Club will meet for a 1.1- and a 1.6-mile loop at 5:30 p.m. Feb. 22 behind the Grumman Bldg. at Ellington Field. For more information call Juliette Wolfer at x38459.

Cafeteria menu: Special: smoked barbecue link. Total Health: roast pork loin. Entrees: cheese enchiladas, roast pork and dressing, baked chicken, steamed pollock, Reuben sandwich. Soup: seafood gumbo. Vegetables: Italian green beans, Spanish rice, turnip greens, peas and carrots.

Thursday

Blood drive: Lockheed will host its annual blood drive from 8-11:30 a.m. Feb. 23 at the Lockheed Plaza One Bldg. For more information call Joe Victor at x34891.

Cafeteria menu: Special: chicken fried steak. Total Health: roast beef with gravy. Entrees: steamed pollock, lasagna with meat, steamed pollock, catfish, French dip sandwich. Soup: cream of turkey. Vegetables: whole green beans, butter squash, cut corn, black-eyed peas.

Friday

Cafeteria menu: Special: fried chicken. Total Health: vegetable lasagna. Entrees: pollock hollandaise, beef stroganoff, vegetable lasagna. Vegetables: steamed broccoli, carrots vichy, Italian zucchini, breaded okra.

Feb. 27

Quality conference: The Third Annual Conference on Quality in the

Space Industry will be held from 8-6 p.m. Feb. 27 at South Shore Harbour Resort. For registration and information call Glen VanZandt at x33069.

March 8

PSI meet: The Clear Lake/ NASA Area Chapter of Professional Secretaries International meets at 5:30 p.m. Mar. 8 at the Holiday Inn on NASA Road 1. Dr. Gloria Goldstein presents "Living in the NOW; No More Procrastination." For additional information, contact Elaine Kemp x30556.

March 15

Contract seminar: Space Center-Houston Chapter of the National Contract Management Association will host the Spring National Education Seminar from 8:30 a.m.-5 p.m. March 15 at the University of Houston Clear Lake bayou bldg. auditorium. The one day seminar will address the fundamentals of contract costs. Registration for members is \$135, nonmembers \$185. For registration information civil servants should contact Richard Regenburgh at 244-5973, contractors should call Kathleen Martins at 333-7191.

March 30

AIAA workshop: The American Institute of Aeronautics and Astronautics will host a real time workshop on MATLAB from 9 a.m. to 4 p.m. March 30 at the LPI Lecture hall. For additional information call Naz Bedrossian at 333-2127.

April 12

PSI meet: The Clear Lake/NASA Area Chapter of Professional Secretaries International meets at 5:30 p.m. April 12 at the Holiday Inn on NASA Road 1. For information, contact Elaine Kemp x30556.

recvr, VSX-502, 9 funt, \$300. Ron, 474-3612.

Photography

B/W video camera, great for desktop publishing, \$95; Picture-in-picture video box for TV/ VCR, \$125. 282-3570 or 474-3820.

RCA VHS video cass portable record/player w/color camera & bag, \$150/obo. 946-4013.

Canon L1 camcorder interchangeable lens, 15x zoom lens, misc, \$1.3k. x32596.

Nikon FE w/motor drive body, w/o lens, \$450; Nikon 202 built in winder/flash w/o lens, \$450; Nikon F3 w/drive & action finder, \$850; Nikon, 50 1.8, 50 1.4, 85 1.4, 24 2.8, many others. x32596.

Zenith VHS-C camcorder, batteries, recharger, RF-switcher, camera leather bag, \$195. Pete, x31694 or 481-8561.

Large Format camera, 4"x5" w/lenses, film holders; medium format, 6x6 cm, Bronica S2A w/3 lenses, meter; large format enlarger w/lenses for 4"x5", 6x6 cm, 35 mm, dk room equip. Kevin, 538-3141.

Mamiya M645, 6x4.5 cm single lens, Reflex; PD-Prism viewfinder; lens; 45 mm 2.8 Sekor; 80 mm 2.8 Sekor w/lens hoods; 120 & 220 roll film inserts; Delux L-grip; closeup kit; flashbracket; aluminum case, ex cond make offer. John, 326-2461.

Upright piano, Schaff Bros, good cond, \$350/obo. Glenn, x38067 or 480-7019.

Yamaha 12 string guitar, good cond, \$400; Gibson 335 elect w/micro tuning bridge, case, \$450. Kevin, 333-3703, x121, or 538-3141.

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frame, dresser/mirror/nite stand, \$465; solid oak rocking chair, \$95. Kim, 996-0152.

Couch, 3-cushion brn & beige tweed colonial, \$95; LR chair, mauve miniprint slipcover, \$25; Sears microwave, \$75. 488-4487.

Tweed L-sectional sleeper/sofa, good cond, \$150/obo. Allen, x47584 or 486-5740.

Whirlpool W/D, stacking, \$425. 488-4463.

Qn sz oak wall unit bed/mirrors/light bar, cabinets/shelves/matt, \$750/obo. 488-8460.

Solid wood bunk beds, \$75. x31045 or 554-5832.

Tappan gas built-in oven, upper oven & lower broiler, blk front glass panels, \$250/obo. Dennis, x34405 or 532-3312.

Kg sz bed, \$500/obo. x36707 or 532-2101.

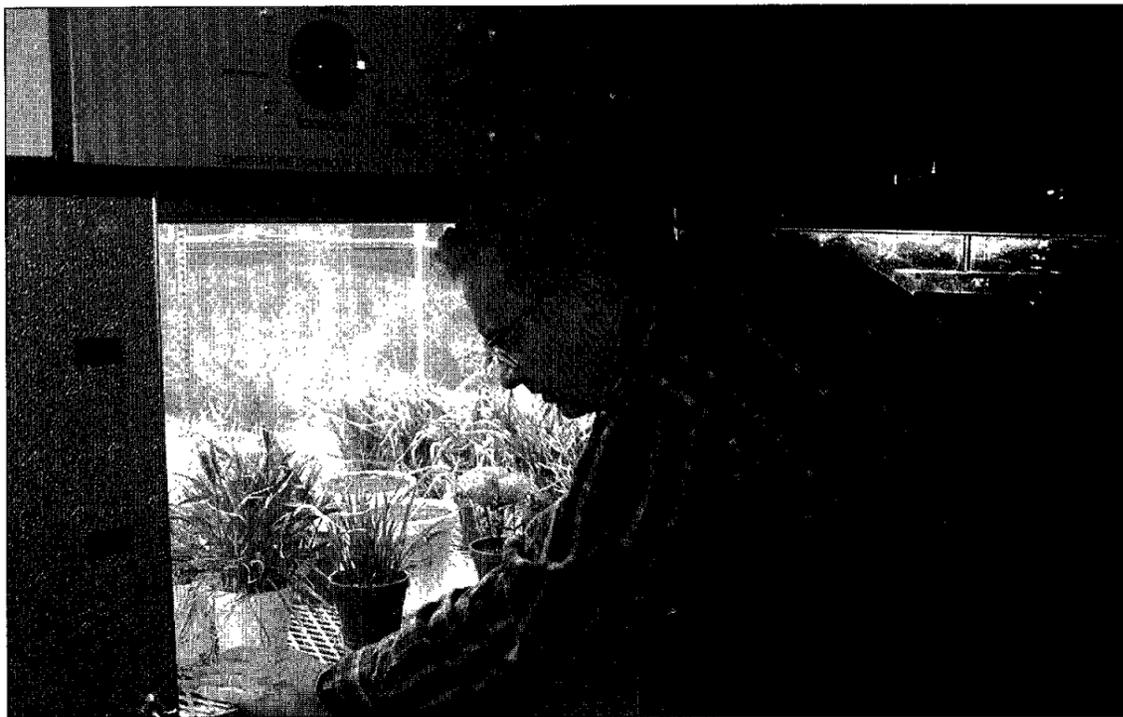
infant carrier; misc baby clothes & items. Shawn, 947-0656.

Wheelchair, by Invacare Ridelite, \$300; folding safe-t-walker w/wheels, \$60. 488-4487.

Rowing machine, \$75; stair climber, \$350. 328-3840.

Growth Medium

JSC-developed synthetic soil reaches out to students, holds potential for growers on Earth



By Kelly Humphries

Sometimes, you have to get your hands dirty when you're looking for a better way to do things in space. But rarely is that accomplished as literally as on last week's STS-63 flight of *Discovery*.

That's because space shuttles don't normally carry dirt.

But a team of JSC scientists is now eagerly inspecting the dirt—make that synthetic solid substrate—that helped the University of Wisconsin's "fast plants" grow on the STS-63 Astroculture 4 experiment. And their inspections are being mirrored around the country at schools that participated in the university's Fast Plants Program.

The JSC effort was a collaboration by scientists in the Space and Life Sciences and Engineering Directorates led by Doug Ming, Don Henninger, Dan Barta and Keith Henderson. Ming, of the Earth Science and Solar System Exploration Division, and Henninger, of the Crew and Thermal Systems Division, developed the concept of zeoponics, or cultivating plants in a zeolite mineral substrate. They tested it in the Crew and Thermal System's Division's Advanced Life Support Laboratory, run by Barta and Henderson, with the help of Dr. D.C. Golden of Dual Inc., Dr. Earl Allen, a former NASA graduate student now at Oklahoma State University, and Charlie Galindo Jr. and John Gruener of Hernandez Engineering.

After testing in the JSC lab, the next step was to try out zeoponics in microgravity. That's where the symbiosis with education came in. While the University of Wisconsin researchers involved in Astroculture 4 had selected their fast plants to fly on STS-63, they needed an appropriate growth media. They chose the zeoponic plant growth media developed at JSC.

"They needed a solid substrate and we were designing a solid substrate, so the collaboration worked out well," Ming said.

Secondary and primary schools throughout the U.S. grew their own "space gardens" in their classrooms at the same time the astronauts aboard *Discovery* were growing theirs in the Spacehab module. Twenty fast plants and 23 wheat plants were grown in the Astroculture plant growth facility.

Fast plants are small plants related to cabbages and mustards with a rapid growth cycle that makes them ideally suited for short space flights and school projects confined by short semesters, youthful impatience and small spaces. They grow to full size in 35 days, require only a 2 centimeter square of soil to grow and can use fluorescent lights. They are used as living models for plant growth and development, life cycle, ecology and biotechnology experiments.

One of the 14 pilot classrooms participating in the fast plants experiments nationwide is right here in Houston, the Rice Model Lab School at Lanier Middle School. Barta and Dr. Robert Morrow of the University of Wisconsin hosted a visit last Wednesday by 22 sixth-grade students and their two teachers, Deanna Lee and Nedaro Bellamy and their classes spent most of the day at JSC. On a tour through the laboratory, Ming, Henderson, Brian Sauser of GB Tech, Terry Tri and coop student Jeanette Silva showed the students many of the different aspects of JSC's current and proposed efforts for growing plants for advanced space missions.

According to Ming, the idea of using synthetic soils to grow plants in space started about six years ago as an offshoot of studies on how to grow plants on the Moon or Mars. Until then, most researchers were concentrating on using hydroponics, which circulate nutrients to plants through water. But hydroponic

systems are complex and hard to maintain, so Ming and Henninger got their fingernails dirty and began studying the feasibility of using zeolites, a group of minerals that occur naturally or can be synthesized, as a growth medium for outposts.

"It gives us another option," Henderson said. "Most people look at hydroponics as the way to go for plant growth in space. We're kind of newcomers. The use of zeoponics doesn't have the background of Earth-based research and confidence of how to do it. We believe these types of flight experiments are a step forward in credibility."

"Zeolites have unique chemical and physical properties," Ming explained. "They have the ability to retain plant nutrients in a much higher quantity than soils do due to their internal crystal structure. They are very porous in nature, and they have channels through the crystal structure that allow the plant nutrients to be essentially stored."

Such soils also have important applications on Earth. The key is their slow-release mechanism, Ming said. In much the same way that one cold relief medicine once advertised its "tiny time capsules," zeolites can be used in areas where too much fertilizing might cause environmental concerns such as excessive nutrient runoff into groundwater supplies. An example, he said, is golf greens which are mostly sand and have to be fertilized as many as 10 times a year.

"The material we have designed has

potential to slowly release these nutrients for years without having to put fertilizer back in," Ming said. "It has the nutrient capacity for several crops."

While the applications are many, the expense of synthesizing the soils could be prohibitive for some, such as improving soil fertility in developing countries. But there are other areas such as commercial greenhouses and house plants that may be viable. The developers have two patents pending that may be granted within the next few weeks, and several private companies are working on licensing the technology.

The soil and technology that flew on STS-63 were tested in the Advanced Life Support Lab.

"Our role is long-range technical development that would incorporate plant growth into life support systems, with emphasis on planetary outpost systems," Henderson said. "Plant growth would provide food, and it would also provide oxygen and absorb the carbon dioxide as well as play a role in water reclamation."

The lab, which was begun four years ago to study soil chemistry, fertility and mineralogy, has grown gradually and expanded its research to include both hydroponics and solid substrates (soils), and possibly even lunar soil itself, he said. At present, space biologists are favoring Ming's approach because it minimizes the complexity of systems engineering and plumbing, as well as the mass and volume.

"It's a reliability issue," Henderson said. "If we can perfect the media, the electrical and mechanical components are minimized."

Ming said the Astroculture plants grew during the eight-day flight of *Discovery*. Some of them looked quite good, while others were marginally poor—about what you'd expect from an experiment.

But the teamwork that grew out of the collaboration of the Space and Life Sciences and Engineering Directorates was a total success that should bear additional fruit in the future.

"It's been a superb exercise in teamwork," Ming said. "Without the interface of the engineers from EC along with a couple of their scientists there who are plant physiologists in conjunction with the soil scientists here in SN we could never have pulled this off." □



'It's been a superb exercise in teamwork.'

—Dr. Doug Ming



Top: Dr. Keith Henderson inspects plants grown through zeoponics in the Bldg. 241 Advanced Life Support Laboratory. Center: Dr. Doug Ming and Dr. Dan Barta inspect plants grown in a synthetic soil developed by Ming and flown on STS-63. Bottom left: Chris Carrier, left, and Brian Sauser, both of GB Tech, move a cart full of plants out of the growth chamber. Bottom right: The zeoponics and ALSL team includes, front from left, Brian Sauser, Charlie Galindo, Susan Steinberg, Dr. D.C. Golden and Chris Carrier; back, Fred Smith, Dr. Keith Henderson, Dan Barta, John Gruener and Doug Ming.

Space radar data aids study of ancient jungle city

Images from the international Space Radar Laboratory may help researchers find previously unknown settlements near the ancient city of Angkor in Cambodia.

The radar data was obtained during the October flight of *Endeavour*, processed and sent to the World Monuments Fund. The group had approached the radar science team about observing the Angkor area after SRL's first flight in April 1994.

"I had read about the radar mission while the April flight was in progress and instantly surmised that it would have applications to the international

research efforts at Angkor," said John Stubbs, program director for the fund. "I didn't really know where to start, but I was hopeful NASA would be willing to image the area around Angkor."

Angkor, a vast complex of more than 60 temples dating back to the ninth century A.D., served as the spiritual center for the Khmer people. At its height, the city housed an estimated population of one million people and was supported by a massive system of reservoirs and canals.

The April flight of SRL's complementary radars, the Spaceborne

Imaging Radar-C/X-band Synthetic Aperture Radar, first demonstrated their capability to obtain vast amounts of data applicable to ecological, oceanographic, geologic and agricultural studies.

"We realized after the huge success of the first flight that we could be more flexible in adding new sites to the timeline of flight two," said Dr. Diane Evans, the SIR-C project scientist at NASA's Jet Propulsion Laboratory. "Since our science team was interested in studying as much of the tropical rain forest as possible, Cambodia and the Angkor site

seemed to be a great complement to our ecology objectives."

Today, Angkor is hidden beneath a dense rain forest canopy. Its temples have been ravaged by weather, war and looters. Its extensive irrigation system has fallen into disuse.

"The radar's ability to penetrate clouds and vegetation makes it an ideal tool for studying Angkor," Stubbs said. "I can see the canal-and-reservoir system very clearly in the radar imagery, and preliminary analysis reveals what may be evidence of organized settlements of large tracts of land to the north of the

present archeological park, which until now, has gone unnoticed."

The SIR-C/X-SAR data will be used by research teams from more than 11 countries to understand how the city grew and then fell into disuse over 800 years.

"The 'temple mountain' monuments at Angkor are not unlike some of the pyramidal forms encountered in Central America," Stubbs said. "The sheer size and sophistication of Angkor's great city plan, now enveloped in dense jungle, sets this ancient capital apart as the ultimate jungle ruin."

Project IQ applications being taken

Human Resources is now taking applications for the Project Increased Qualifications Program.

The Project IQ program provides undergraduate college opportunities designed to help employees improve their skills and qualifications, be more productive in their jobs and better qualified for others.

This two-year program gives participants the chance to attend college courses during duty hours. JSC pays for tuition, fees and books. Applicants must be a permanent employee with at least one year of continuous civilian service; occupy a nonprofessional position in grades GS-1 through GS-11; and have a minimum of six semester hours of college-level work, preferably within the last two years. Employees with bachelor's degrees are ineligible.

Applications are in the Human Resources Development Branch, AH3, Bldg. 45, Rm. 146. Completed applications are due April 28. For details, call Kazuko Hall, x33075.

STS-63 crew lauds support

(Continued from Page 4)

and down the cargo bay while holding SPARTAN because of the spacewalkers' reaction to the cold temperatures. The astronauts, however, were never in any danger.

At a homecoming celebration, Wetherbee heaped praise upon his crew, complimenting Voss and Titov on their work with the robot arm, Foale for his wizardry on the support computers, Harris for "making everything work" as payload commander, and Collins for being a veteran from the minute the solid rockets ignited.

"All the hard work really paid off," Collins said, "because it worked. It was a real tribute to everyone who's done such a great job."

Harris said he was almost as cold at the welcome home ceremony as during the space walk, and yet he said the EVA was the most memorable portion of the flight.

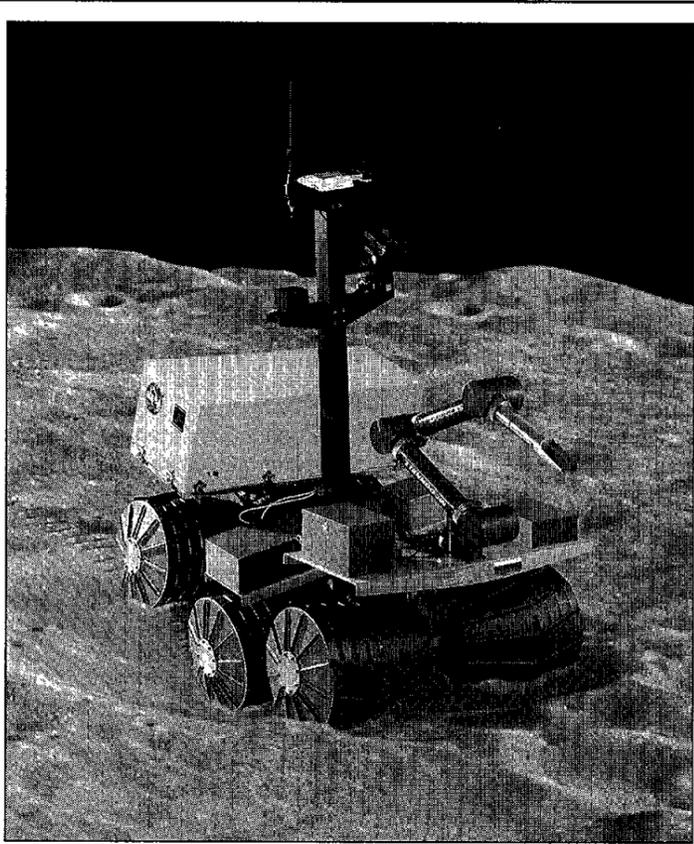
"We had a very successful mission—23 different investigations in Spacehab, 16 DSOs, medical DSOs, life sciences DSOs, and I'm very lucky to be a part of this," Harris said.

Foale said joint U.S.-Russian programs leading to the international station are a tremendous effort, and that although there were some anxious moments because of leaky thrusters, they knew the support team on the ground would come through.

"In fact, we were very much aware of work we knew had to be going on between all of you and in Russia trying to get this problem sorted out," he said. "My thanks to all of you who were working this thing real-time, trying to make this thing come together."

"I can't believe we were the first of these tremendous flights that are coming up," Voss said. "The chances for all these crews coming in the future to see the Mir, to go on the Mir, to build their own station will be great."

Titov recalled a conversation with NASA Administrator Dan Goldin three years ago, when he asked him if he could take him for a flight on the orbiter. "Today, we really can say, 'Yes, the flight is done.'"



NASA Photo

Scientists will use this Russian Marsokhod rover to conduct field tests simulating remote-controlled exploration of the Moon and Mars from laboratories on Earth. Tests were conducted this week in Hawaii Volcanoes National Park on the big island of Hawaii. Students will participate in the JASON Project in Teague Auditorium.

Scientists and students to control Russian rover

From a laboratory in California, NASA scientists next week will drive a modified Russian planetary rover around the most active volcano on Earth.

Scientists at Ames Research Center will use Russia's modified Marsokhod rover to conduct field tests simulating remote-controlled exploration of the Moon and Mars from laboratories on Earth. Tests were conducted this week in Hawaii Volcanoes National Park on the big island of Hawaii.

The Marsokhod is capable of traversing both Martian and lunar terrain. The same Russian team that developed the successful Lunakhod rovers has been developing the Marsokhod for possible future missions to Mars. Its superior mobility also makes it suitable for more ambitious lunar investigations. It is equipped with six cone-shaped titanium wheels, each with its own drive motor, which enable it to climb over large boulders nearly 3 feet tall. It also has a robotic arm built by McDonnell Douglas to retrieve objects, and video cameras to transmit live stereo images.

"The combination of the Russian rover chassis with western avionics is an excellent example of the benefits that are possible from international cooperation," said John Garvey, project manager for the McDonnell Douglas team that is sponsoring the use of the Russian chassis for the activities in Hawaii.

"The rover takes advantage of new technologies from other programs like last year's Clementine mission to the Moon and NASA's upcoming Mars Pathfinder," he added. Both are examples of small, capable, relatively cheap spacecraft for planetary explo-

ration. "We now have a sophisticated prototype of a long-distance rover that could start exploring the Moon in the very near future."

The test site in Kilauea Volcano's summit caldera and southwest rift zone is located about 30 miles southwest of the town of Hilo. This barren, volcanic terrain is similar to what scientists expect to find on another planet. At an elevation of 4,000 feet, the remote site has sparse vegetation and is comprised of ash deposits, jagged rocks and loose, crumbly lava.

During the first three days of tests, scientists controlled the Marsokhod using a Virtual Environment Vehicle Interface software program to simulate a Mars mission. Scientists are hoping to make the tests as realistic as possible.

Upon completion of the Mars and lunar simulation tests, the team will then transport the rover to a site in the park where lava flows into the sea at Lae Apuki. From Feb. 27 to March 11, the Marsokhod will participate in the JASON VI "Island Earth" Project.

Students from various Primary Interactive Network sites will drive the vehicle over dried lava beds in Hawaii from their auditoriums using remote-control software. A camera mounted on the rover shows where the vehicle is pointing. The students also will operate the robotic arm, lowering it by remote control so cameras mounted on it can see interesting features of the lava rocks.

Employees at JSC may view the progress of the Hawaiian exploration Monday-Friday, Feb. 27-March 10, at 9 and 10:30 a.m., noon, and 1:30 and 3 p.m. in the Teague Auditorium.

Employees can get Moscow medical care

With the increase in government-related travel to Russia, the Occupational Health Clinic has come up with a way for employees to access western medical services when in Moscow.

This medical care is available through a corporate membership with Medclub of Moscow, a joint venture between Medclub Montreal and the Glavmosstroy Hospital in Moscow. The membership provides 24-hour access for local ambulance service and medical care for all NASA and contractor personnel while in Russia on official government business.

To receive medical service employees will be required to have a copy of the corporate membership card, a copy of their travel orders, and a passport/visa. Employees will be asked to pay for services rendered with subsequent reimbursement to follow with the submittal of claims to standard insurance carriers.

Copies of the membership cards for NASA and contractor personnel can be obtained by contacting the Occupational Health Clinic in Bldg. 8 at x34111. If you have questions, please call the clinic at x34111 or Jan Read at x33022.

SOLE, AIAA host symposium

The American Institute of Aeronautics and Astronautics and the Society of Logistics Engineers are getting together to host the sixth Space Logistics Symposium.

The symposium will held Wednesday through Friday at the South Shore Harbour Resort and includes several distinguished guest speakers. JSC Director Dr. Carolyn L. Huntoon and Space Station Program Office Manager Randy Brinkley will discuss "Integrating Space Logistics in the Future—Working Smarter with Fewer Resources," the theme for this year's symposium.

Speakers include Howard Trudeau, vice president of engineering for Lockheed Missiles and Space Co.; Doug Stone, vice president for the Space Station Program at Boeing Defense and Space Group; Ken Cox, assistant to the JSC director of engineering; and Dr. Benjamin Ostrofsky, professor of industrial engineering and operations at the University of Houston.

Technical workshops, exhibits, panel discussions and tours of some local facilities are some of the highlights of the symposium. For details call Steve Zobal at 244-4231.

Pier dedicated to JSC employee

Long-time JSC employee Bill Huber, acting chief of the Manufacturing Process Development Branch, suffered a fatal heart attack while at work Feb. 8.

Huber joined the JSC team in 1964, working 20 years in the Facilities Design Division where he was section chief, branch chief, and later as division technical assistant. His design projects ranged from government support and precision laboratory equipment to critical flight hardware. These included items such as the then top-secret EVA hand-held maneuvering unit used by astronaut Ed White and various Apollo and Lunar surface hand-tools.

Other projects included the Skylab parasol used to shade the Skylab

module when its insulating panels were damaged during launch; and various crew-related flight equipment and hardware items.

In 1984 he moved to the space station program. There, he used his knowledge of computer-aided design and databases to help assemble an integrated "electronic library" for station hardware drawings and documentation. Most recently he had an integral role in the newly formed Manufacturing Division in the Engineering Directorate.

A memorial fishing pier in Huber's honor is being planned at Countryside Park in League City; donations may be sent to the Bill Huber Memorial Fund, c/o League City Bank & Trust.



Huber

Space News Roundup

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Editor Kelly Humphries
Associate Editor Karen Schmidt

Endeavour next on launch pad for astronomy mission

(Continued from Page 1)

instruments as they make precise measurements of planets, stars and galaxies in relatively small fields of view. The instrument pointing system will provide stability over extended periods needed for highly accurate pointing as *Endeavour* orbits 190 nautical miles above the Earth and its astronomy-hampering atmosphere.

Also on board will be the Commercial Materials Dispersion Apparatus ITA Experiments, two Protein Crystal Growth enclosure systems, the Middeck Active Control Experiment, the Shuttle Amateur Radio Experiment-II and the Midcourse Space Experiment.