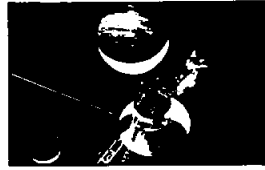




Star duster

Herb Zook is dusting off his DDS experiment data for the launch of Galileo in October. Story on Page 3.



Neptune bound

Voyager 2 fast approaching the nether world of Neptune and its major moon, Triton. Photo on Page 4.

# Space News Roundup

Vol. 28

June 9, 1989

No. 23

## Voyager begins Neptune visit, taking images

By James Hartsfield

Voyager 2, a 12-year veteran of three planets and 39 moons, has parted the curtains for its final hurrah 2.7 billion miles from Earth.

On Monday, the spacecraft began the 125-day observatory phase of its encounter with Neptune, at present the most distant planet from the sun. Voyager 2 is now regularly snapping about 50 photographs of Neptune a day as it steadily looms larger. The probe has assumed center stage among spacecraft being tracked by NASA's Deep Space Network, at the top of that network's priority list. Its final bow will come on August 24 when it dips to within 3,000 miles of Neptune's clouds and then passes 24,000 miles from Triton, Neptune's major moon.

"Now that we've entered the observatory phase we'll be taking about six images every three hours to study changes in the atmosphere from rotation to rotation," said Dr. Ellis Miner, Voyager deputy project scientist. Voyager mission controllers at the Jet Propulsion Laboratory are now tracking the spacecraft 24 hours a day.

Already, the images that have completed the four-hour journey from Voyager to Earth have shown details of the planet's dense, murky atmosphere. A large, dark spot, similar in size to the Jovian Great Red Spot relative to each planet's dimensions,

has been recorded. A dark band encircling the south polar region also has been seen. Voyager's cameras will be tracking these features during the next three months to target impending close-up imaging of them.

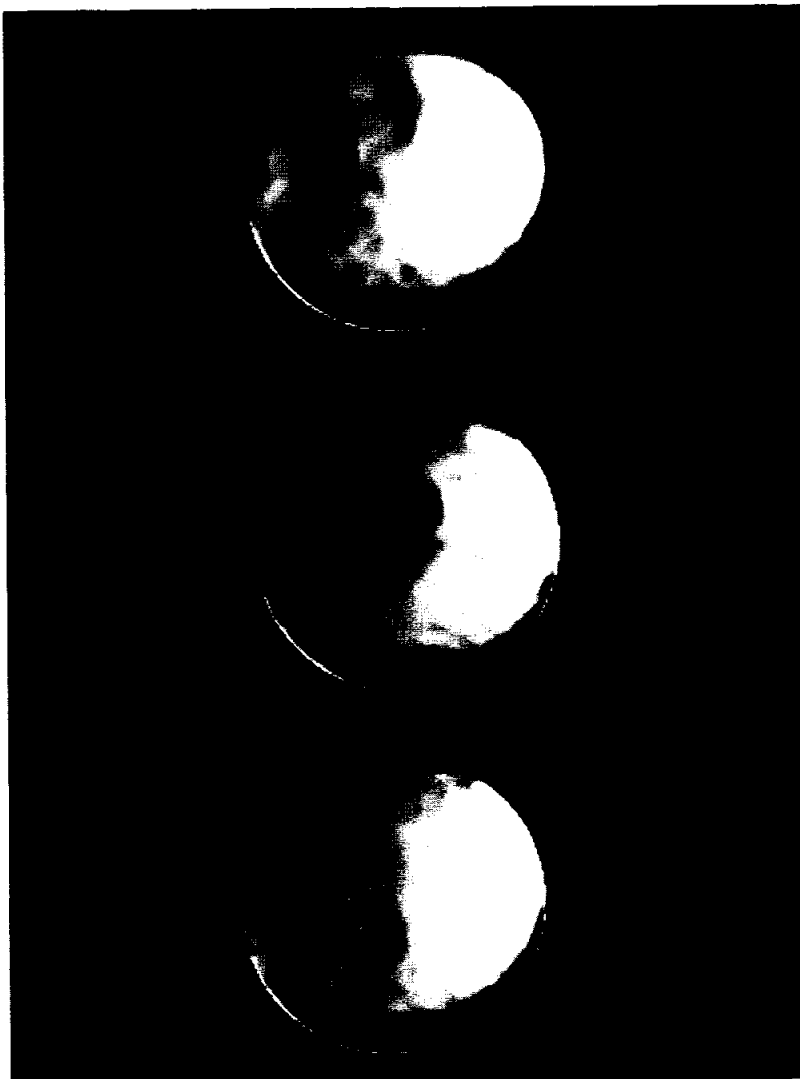
In addition to taking images of Neptune, Voyager 2 also will make systematic ultraviolet observations, searching for auroras and escaping gases. The spacecraft's instruments are being calibrated in preparation for critical near-encounter observations.

Voyager 2's images of Neptune will be broadcast on NASA Select television at 11 a.m. CDT Tuesday. Throughout the observation phase of Voyager's encounter, the previous week's images of Neptune will be broadcast on NASA Select each Tuesday at that time. The broadcasts are expected to be about one hour long and will feature a replay of the first-order reconstruction of Voyager's images.

Voyager 2 was launched in 1977 and has visited Jupiter, where it observed seven known moons and discovered two more; Saturn, where it observed 17 known moons and discovered two; and Uranus, where it observed five known satellites and discovered 10. Its encounter with Uranus occurred in 1986.

Neptune will be the space probe's final planetary observation.

Please see NEPTUNE, Page 4



JSC Photo

**ON STAGE — Voyager 2 has taken the stage for its final show, an encounter with Neptune. These images of Neptune were acquired 90 minutes apart on April 3 and show distinct atmospheric features, including a large, dark spot and a dark band encircling the south polar region. The most recent images of Neptune, taken this week, will be shown on NASA Select at 11 a.m. CDT Tuesday.**

## TDRS-4 now operational

Tracking and Data Relay Satellite-4 (TDRS-4), deployed from *Discovery* on March 13, became operational Saturday, Goddard Space Flight Center officials said.

TDRS-4, the third tracking and data relay satellite in orbit, assumed communications responsibilities that had previously been handled by TDRS-1 since April 1983. At about 10:30 a.m. CDT Sunday, controllers began moving TDRS-1 to a new geosynchronous location, 79 degrees west longitude, where it will serve as a backup to the other two tracking satellites.

Once TDRS-1 has drifted to its new location, the TDRS constellation will be complete.

NASA's worldwide ground station network, used since the beginning of the manned space program, could only maintain contact with spacecraft for about 15 to 20 percent of each orbit. The space-based TDRS network allows contact with the shuttle and other user spacecraft for at least 85 percent of each orbit and can handle faster transmission of more information.

"TDRS-4 will be located at 41 degrees west longitude just off the coast of Brazil, and TDRS-3 is on station over the Pacific south of Hawaii at 171 degrees west longitude," said Charles T. Force, acting associate administrator for Space Operations at NASA Headquarters.

"TDRS-4's position was 47 degrees west longitude when it became operational," added Roger Flaherty.

Please see TDRS, Page 4

## Columbia turbopump replaced, flight still on schedule

By Kyle Herring

Work to prepare the first Space Shuttle Orbiter *Columbia* continues at the Kennedy Space Center for its launch on mission STS-28 scheduled for no earlier than July 31.

In its hangar at the Orbiter Processing Facility, the heat shield was removed to gain access to *Columbia's* main engine number one in order to remove and replace the high pressure hydrogen turbopump.

The pump was found to have a

small leak during the helium signature leak checks last week. A spare pump is on hand and ready for the operation.

Managers decided to change the pump out in the OPF rather than wait until *Columbia* and its external tank/solid rocket booster stack reached the pad. Currently, no processing delay is expected, as the pump changeout can be done in parallel with other work on the orbiter.

Redundancy tests of orbiter sys-

tems continued this week as did work on the landing gear assemblies. The landing gear was checked out for flight with pressurization of the struts



on Wednesday. Technicians positioned the landing gear doors for a tight fit and smooth closure.

Thermal protection system operations are continuing, with about 45 tile cavities remaining.

Crew members for *Columbia's* return to flight—a dedicated Department of Defense mission—were at the launch site earlier this week for the traditional walkdown of the vehicle to make sure no sharp edges that could catch on their suits were exposed.

Commander Brewster Shaw, Pilot Dick Richards and mission special-

ists Dave Leestma, Jim Adamson and Mark Brown will return to KSC next month to take part in the practice countdown for the actual launch. In the meantime, they will continue to train here at JSC in the Shuttle Mission Simulator along with the flight control team in the Mission Control Center.

*Columbia's* target date for tow to the Vehicle Assembly Building for mating with its external tank and solid

Please see COLUMBIA, Page 4

## Diaz named to Science post; Hartsfield heads Space Flight/Space Station Integration Office

Alphonso V. Diaz, division vice president for space and aeronautics services for General Electric Government Services, Cherry Hill, N.J., has been named as deputy associate administrator for space science and applications.

Also this week, veteran astronaut Henry Hartsfield was assigned temporary duty in the Office of Space Flight at NASA Headquarters. Hartsfield replaces astronaut Robert Parker as director of the Space Flight/Space Station Integration Office, reporting directly to the Associate Administrator of Space Flight.

The Space Flight/Space Station Integration Office was established in 1987 to coordinate the exchange of information between the two programs. The office serves as a forum for resolving technical and programmatic issues. Parker returns to JSC to begin training for his mission specialist assignment on STS-35, scheduled for launch next spring.

In announcing Diaz's appointment, Associate Administrator for Space Science and Applications Dr. Lenn-

ard Fisk said, "Al's extensive NASA management experience and technical involvement with planetary exploration make him a logical choice to serve as deputy," said "Al will be able to provide the office ... with internal expertise and a proven management ability."

After over 20 years with NASA, Diaz joined GE in July, 1988. While there, he was responsible for management of the NASA-related services provided by GE to various NASA installations. He agreed to return following discussions with Acting Administrator Richard Truly and Dr. Fisk, who underscored the contributions he could make to the agency's heavy space science schedule because of his NASA and GE experience.

Diaz's NASA career began as a cooperative education student at Langley Research Center in 1964. At Langley he worked on the technical development of the Viking organic analysis experiment, and for the Solar System Exploration Division. While at

Please see DIAZ, Page 4



Photo by Benny Benavides

**CHILLER CONSTRUCTION, PARKING WOES BEGIN—Center Director Aaron Cohen and Kenneth Gilbreath, director of Center Operations, were joined by top officials of the design and construction contracting firms for groundbreaking ceremonies for the new auxiliary chiller facility, Bldg. 28, on June 1.**

The 8,400 square foot facility, which will provide 4,000 additional tons of chilled water to cool the center, should be completed by July 3, 1990.

Part of the project includes the installation of nearly 10,000 feet of underground piping connecting the facility with the central chilled water system in the utility tunnel.

These connecting points are located near Bldgs. 4 and 8, and eventually to Bldg. 31. The work will require the excavation of deep trenches across Fifth Street, through the parking lot north of Bldg. 35, and in the driveway and parking areas between Bldgs. 29 and 31.

"Construction of additional parking areas to be located south of Bldg. 35 is planned, and will proceed as soon as funding permits," said Barry Wittschen, project manager.

Pictured left to right: Jerry Smith, project manager, Lockwood, Andrews and Newnam; E.D. Carter, Facility Development Division chief; Bert Harrop, president, Harrop Construction Co.; Cohen; Gilbreath; Jim Wilhelm, president, Lockwood, Andrews and Newnam; and Wittschen.

JSC

# Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays: FBA cards are still available to civil service employees at Bldg. 11 store. FBA Scholarship applications are now available in Building 1 room 840 for FBA members.

General Cinema (valid for one year): \$3.50 each.  
AMC Theater (valid until May 1990): \$3 each.  
Sea-Arama Marineworld (Galveston, valid until Aug. 17, 1990): adults, \$8.75; children \$5.50.

Sea World (San Antonio, year long): adults, \$17.25; children \$14.75.  
Palm Beach at Moody Gardens (valid until September 1989): adults \$2.75; children \$1.50.

Astroworld (valid 1989): adults, \$14.12; children under 4, \$11.99; season pass, \$32.36; Waterworld (valid 1989): \$8.15.

Houston Balalaika Concert (June 10, Cullen Theatre of Wortham Center, features NEVA Russian Dance Ensemble, songs from "Dr. Zhivago," "Fiddler on the Roof"): \$14.

River Raft Trip (July 15, tickets go on sale June 12): \$30.  
Overnight River Raft Trip (July 15-16, tickets go on sale June 12): \$72.  
Las Vegas Trip (August 17-20, call for reservations): credit charge, \$280; cash charge \$275.

JSC

# Gilruth Center News

**Sign up policy**—All classes and athletic activities are first come, first served. To enroll, you must sign up in person at the Gilruth. Everyone will be required to show badge or EAA membership card. Payment must be made in full at the time of registration. Classes tend to fill up four weeks in advance.

**EAA badges**—Dependents and spouses may apply for a picture I.D. 6:30-9:30 p.m. Monday-Friday.

**Defensive driving**—Course is offered from 8 a.m.-5 p.m., June 17 or July 7: \$22.

**Weight safety**—Required for use of the Rec Center weight room. Classes will be 8-9:30 p.m., June 14 and June 29; cost is \$4.

**Aerobics and exercise**—Both classes are ongoing; cost is \$24.

**Tennis lessons**—Beginning tennis, Mondays 5:15-6:45 p.m. Six week course begins June 26; \$32 per person.

**Scuba lessons**—The course includes classroom and pool sessions, open water dive. Five-week class begins July 10; cost is \$45, plus additional fees.

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. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

## Property

Sale: Houston, Sharpstown/HBU area, 3-1.5, det. all brick, \$67,000. 282-4593 or 331-0108.

Sale: Remod., 3-2-2, 1,800 sq. ft., den w/FPL, all brick, redwood deck w/spa, assume at 9.875%, by owner until 6-5-89, \$69,500. Richard, 474-9334 or x30271.

Sale/Lease: Austin/UT condo, 1-1, near law school, assume loan, lease \$395/mo. J. Craig, 282-1911 or 420-2936.

Sale: Friendswood/Sun Meadow Estates, wooded lot in estab. neighborhood, cul-de-sac, bordered by stream and golf course on 2 sides, approx. 245' deep and up to 86' wide, util. on site, \$31,500. Doug, x32860 or 486-7412.

Rent: Kauai, 2 BR, 1.5 BA condo, view of Pacific, cliffs of Princeville, \$500-\$700 depending on season. (714) 768-3840.

Rent: Lake Livingston, waterfront, 3-2, fully furn., new cond., covered decks, pier, sleeps 6, ex. fishing/swimming/skiing. 482-1582.

Lease: Sagemeadow, 4-2-2, fence, FPL, formal dining, private courtyard, good neighborhood, avail. June 15, \$625/mo. plus dep. 480-0667.

Wedgewood village subdivision, Friendswood, 2 residential lots, ea. approx. 70' x 185', neighboring homes, \$90's-100's, one mi. from new Clearbrook High School, owner fin. w/10% down. 482-5226.

Lease: Bay Glen, 4-2-2, brand new, microwave, whirlpool tub, ceiling fan, fence, no pets, non-smoking, \$1,000/mo. 480-4160.

Lease: House near NASA and Ellington, 2 BR, 2 BA, 2-car gar., CA/H, appl., ceiling fan, blinds, fenced yard, \$425/mo. 485-9834.

Lease: Friendswood/Forest Bend, 3-2-2, ceiling fan, patio, fenced, convenient location, \$495/mo. 482-6609.

Lease: Townhome, 2 blks. from NASA, 2-2.5, cov. dbl. carport, FPL, W/D connections, \$600/mo. plus dep. 486-1837.

Sale: Acreage in Seabrook, 5 mi. from NASA, 3.29 acres w/small 2 BR/1 BA home, hardwood floors, FPL, secluded, owner fin., \$95,000. 532-4784.

Sale: League City, 2.06 acres, near schools, city water and sewer avail., 15 min. from NASA, \$39,950. (713) 554-6695.

Sale: League City, 2-2-1.5 w/formal din. room, no mud tax, miniblinds and drapes, solar screens, lg. patio, lg. lot, fenced yard, no down, no closing, 10% VA assum. payments \$606. incl. everything, must qualify, price red. to \$50,000. OBO. 538-4072.

Rent: League City, 3-2-2, FPL, nice neighborhood, avail. June 16, no pets, lawn care incl., \$750/mo. 554-6200.

Rent: Cancun, MX., 1-BR villa, 5-star resort, sleeps 4, satellite T.V., kitch., maid serv., rec. amenities incl., \$76/night, Jul 29-Aug 5. 729-0654.

Rent: Mobile home lot, \$85/mo., \$50 dep., Oklahoma and Kinne, Baciliff. 488-1758.

Sale: 1-BR condo, 10 min. from NASA, very nice, new A/C unit, new dishwasher, W/D, priv. ent., vaulted ceiling, ceiling fan, pool, tennis, loan

bal. \$23,600, owner will finance. 280-1989 or (409) 925-8593.

Sale: Heritage Park 4-2-2, walk-ins, sep. master suite, clean, patio cover, fenced, stove, refrig., assum. VA loan. 334-1909.

Lake Travis cabin, priv. boat dock, CA/C, fully equipped, rental rate, \$425/wkly. 326-5652.

Rent: Condo in Kauai, Hawaii, July 8-14, fully furn., sleeps 6, \$65/night or \$400/wk. Lisa, x32683 or 480-3859.

Sale: Alvin, 3-2-4, brick, \$52,900 cash or 15K equity, no city taxes. x38456 or 388-1090.

Lease: 2-2-2 townhouse in SW Houston, microwave, W/D, FPL, dishwasher, sec. alarm, ceiling fans, elec. gar. door opener. Tom, x31418 or 781-7798.

Sale: Middlebrook 3-2-2, well-maintained, many updates, new paper, paint, assum. low equity, \$79,700. x32805 or 486-1888.

Lease: Sageglen, Perry home, ex. neighborhood, 20 min. to NASA, \$650. Eric, 483-8920.

Lease: 2 BR, 1 BA apt. in Webster/Clear Lake, many extras, \$360. Dave, x38156 or 486-5181 or Eric, x38420.

Sale/Lease: 4 BR, 2 BA home in Alameda Mall area, many extras, \$650/mo. Herb, x38161 or 481-1253.

Sale: Hilltop Lakes resort property, 80' x 120', wooded lot w/taxiway to runway, \$6,000. 554-6201.

Rent: Friendswood/Heritage Park, new section, 4-2-2, FPL, close to new high school, avail. July 1, no pets. \$825/mo. x33574 or 482-4563.

Sale: Heritage Park, 3-2-2 home, freshly painted, ext. spa, lg. deck, FPL, stainmaster carpet, 10.5% assum., across street from pool, tennis courts and elem. school, \$69,500. x36619 or 996-0289.

Sale: Big Bend area, get away and hunting land, 160 acres, \$140/acre, CFD 20% down, 9% for 5 yrs. 337-4051.

**Cars & Trucks**

'46 Ford PU, all orig., \$3,300. 282-4593 or 331-0108.

'78 Corvette, silver anniv. edition, new 2-tone silver paint w/white int., T-tops, all power, 14K on new Vette eng., rebuilt brakes, suspension, much more, \$9,750. Richard, x30271 or 474-9334.

'76 Dodge power Ram 4x4, very good running and driving cond., new clutch, new brakes, power winch, \$3K. George, 944-9761.

'82 Chevrolet Malibu station wagon, V-6, PS, PB, \$1,900. Matt, x34285 or 486-7260.

'85 Pontiac 6000 LE, auto., V-6, PS, PB, P/W, gauges, AM/FM, \$5,700. Matt, x34285 or 485-7260.

'81 Monte Carlo, V-6, power, air, auto., AM/FM/cass., ex. mech. cond., complete service history, \$2,150. Musgrove, x38356 or 488-3966.

'86 Chrysler LeBaron, 4 DR, Zeibart pg. gar. kept, fully loaded, or assume notes, 996-9738.

'76 TRG, good cond., two tops, overdrive, \$3,125. 282-5213 or 334-1705.

'85 Camaro, V-6, auto., stereo AM/FM/cass., PS, PB, good tires, \$4,850. x37678 or 661-4789.

'76 Mercury Cougar, PS, PB, AM/FM, current inspec. sticker, runs, \$800. OBO. David, 333-6481 or 947-1631.

'71 Volvo 142E, unique restoration opportunity, fuel inj. 5-sp., cold A/C, good tires, \$750. OBO. Ken, x32782 or 488-4036.

'83 Toyota Corolla sta. wagon, 5-sp., AM/FM, \$2,800; '72 Chevy PU, 350 eng., custom hrs., AM/FM/cass., shell, \$1,100. Charlie,

## Today

**Cafeteria menu**—Special: fried chicken. Entrees: fried shrimp, baked fish, beef stroganoff. Soup: seafood gumbo. Vegetables: okra and tomatoes, buttered broccoli, carrots in cream sauce.

## Monday

**Gala tickets on sale**—Tickets for the 20th Anniversary Gala Celebration of the First Lunar Landing at the Hyatt Regency Downtown will go on sale from 11 a.m. to 6 p.m. on June 12 at the Gilruth Recreation Center Ballroom, and will be sold on a first-come-first-serve basis. Each buyer must have a NASA civil service or contractor badge to purchase tickets, and is limited to two tickets. Ticket cost is \$65 per person, and checks and cash are accepted. Checks should be made payable to "AIAA".

**Cafeteria menu**—Special: meat sauce and spaghetti. Entrees: franks and sauerkraut, sweet and sour pork chop with fried rice, potato baked chicken. Soup: cream of potato. Vegetables: French beans, buttered squash, lima beans.

## Tuesday

**Cafeteria menu**—Special: smothered steak with dressing. Entrees: beef stew, liver and onions, shrimp Creole. Soup: navy bean soup. Vegetables: buttered corn, rice, cabbage, peas.

## Wednesday

**Cafeteria menu**—Special: sal-

# Dates & Data

mon Croquette. Entrees: roast beef, baked perch, chicken pan pie. Soup: seafood gumbo. Vegetables: mustard greens, Italian green beans, sliced beets.

## Thursday

**Drugs seminar**—A JSC Employee Assistance Program Seminar will be at 11:30 a.m. June 15 in the Building 30 Auditorium. Tom Rodman, M.A., Substance Abuse Coordinator for the adolescent program of Champions-West Oak Hospital will be discussing "Kids and Drugs: Our Responsibility as Parents and Concerned Members of the Community". Contact the Employee Assistance Program Office at x36130 for more information.

**Cafeteria menu**—Special: stuffed cabbage. Entrees: beef tacos, ham and lima beans. Soup: beef and barley. Vegetables: ranch beans, Brussels sprouts, cream style corn.

## June 16

**CLCTS awards banquet**—The annual Clear Lake Council Technical Societies' Awards Banquet will be at 6:30 p.m. June 16 at the Center. The featured speaker will be Richard Underwood, discussing "Space Through the Eyes of the Camera." Tickets are \$10; deadline for reservations is June 12. Society members or the general public wishing to attend should contact Marcia Taylor at x30195.

**Cafeteria menu**—Special: Salisbury steak. Entrees: fried shrimp, deviled crabs, ham steak. Soup: seafood gumbo. Vegetables: buttered carrots, green beans, June peas.

## June 19

**Juneteenth picnic**—The annual Juneteenth Picnic sponsored by the JSC Black Cultural Association will be held from 4 p.m. to 8 p.m. June 19 at the Gilruth Center. The Ron McNair Scholarship will be presented at the picnic. Tickets are \$6, and proceeds will benefit the scholarship fund. Contact Sheryl Whitaker, 486-1984, Pat Burke, x34831, or Bob Jenkins, Juneteenth chairperson, x38065, for tickets and for more information.

## June 27

**Occidental road relay**—The Occidental 4-by-2 mile corporate road relay will be held June 27 at the San Jacinto monument. There are male, female, and mixed team categories. NASA runners interested in participating should contact Patrick Chimes, x32397, for information; Air Force personnel can sign up with Luis Rodriguez, x38669.

**BAPCO meeting**—The Bay Area PC Organization (BAPCO) will meet at 7:30 p.m. June 27 at the League City Bank and Trust. Contact Earl Rubenstein, x34807 or 326-2354, or Ron Waldbillig, 337-5074, for information.

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. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

## Property

Sale: Houston, Sharpstown/HBU area, 3-1.5, det. all brick, \$67,000. 282-4593 or 331-0108.

Sale: Remod., 3-2-2, 1,800 sq. ft., den w/FPL, all brick, redwood deck w/spa, assume at 9.875%, by owner until 6-5-89, \$69,500. Richard, 474-9334 or x30271.

Sale/Lease: Austin/UT condo, 1-1, near law school, assume loan, lease \$395/mo. J. Craig, 282-1911 or 420-2936.

Sale: Friendswood/Sun Meadow Estates, wooded lot in estab. neighborhood, cul-de-sac, bordered by stream and golf course on 2 sides, approx. 245' deep and up to 86' wide, util. on site, \$31,500. Doug, x32860 or 486-7412.

Rent: Kauai, 2 BR, 1.5 BA condo, view of Pacific, cliffs of Princeville, \$500-\$700 depending on season. (714) 768-3840.

Rent: Lake Livingston, waterfront, 3-2, fully furn., new cond., covered decks, pier, sleeps 6, ex. fishing/swimming/skiing. 482-1582.

Lease: Sagemeadow, 4-2-2, fence, FPL, formal dining, private courtyard, good neighborhood, avail. June 15, \$625/mo. plus dep. 480-0667.

Wedgewood village subdivision, Friendswood, 2 residential lots, ea. approx. 70' x 185', neighboring homes, \$90's-100's, one mi. from new Clearbrook High School, owner fin. w/10% down. 482-5226.

Lease: Bay Glen, 4-2-2, brand new, microwave, whirlpool tub, ceiling fan, fence, no pets, non-smoking, \$1,000/mo. 480-4160.

Lease: House near NASA and Ellington, 2 BR, 2 BA, 2-car gar., CA/H, appl., ceiling fan, blinds, fenced yard, \$425/mo. 485-9834.

Lease: Friendswood/Forest Bend, 3-2-2, ceiling fan, patio, fenced, convenient location, \$495/mo. 482-6609.

Lease: Townhome, 2 blks. from NASA, 2-2.5, cov. dbl. carport, FPL, W/D connections, \$600/mo. plus dep. 486-1837.

Sale: Acreage in Seabrook, 5 mi. from NASA, 3.29 acres w/small 2 BR/1 BA home, hardwood floors, FPL, secluded, owner fin., \$95,000. 532-4784.

Sale: League City, 2.06 acres, near schools, city water and sewer avail., 15 min. from NASA, \$39,950. (713) 554-6695.

Sale: League City, 2-2-1.5 w/formal din. room, no mud tax, miniblinds and drapes, solar screens, lg. patio, lg. lot, fenced yard, no down, no closing, 10% VA assum. payments \$606. incl. everything, must qualify, price red. to \$50,000. OBO. 538-4072.

Rent: League City, 3-2-2, FPL, nice neighborhood, avail. June 16, no pets, lawn care incl., \$750/mo. 554-6200.

Rent: Cancun, MX., 1-BR villa, 5-star resort, sleeps 4, satellite T.V., kitch., maid serv., rec. amenities incl., \$76/night, Jul 29-Aug 5. 729-0654.

Rent: Mobile home lot, \$85/mo., \$50 dep., Oklahoma and Kinne, Baciliff. 488-1758.

Sale: 1-BR condo, 10 min. from NASA, very nice, new A/C unit, new dishwasher, W/D, priv. ent., vaulted ceiling, ceiling fan, pool, tennis, loan

bal. \$23,600, owner will finance. 280-1989 or (409) 925-8593.

Sale: Heritage Park 4-2-2, walk-ins, sep. master suite, clean, patio cover, fenced, stove, refrig., assum. VA loan. 334-1909.

Lake Travis cabin, priv. boat dock, CA/C, fully equipped, rental rate, \$425/wkly. 326-5652.

Rent: Condo in Kauai, Hawaii, July 8-14, fully furn., sleeps 6, \$65/night or \$400/wk. Lisa, x32683 or 480-3859.

Sale: Alvin, 3-2-4, brick, \$52,900 cash or 15K equity, no city taxes. x38456 or 388-1090.

Lease: 2-2-2 townhouse in SW Houston, microwave, W/D, FPL, dishwasher, sec. alarm, ceiling fans, elec. gar. door opener. Tom, x31418 or 781-7798.

Sale: Middlebrook 3-2-2, well-maintained, many updates, new paper, paint, assum. low equity, \$79,700. x32805 or 486-1888.

Lease: Sageglen, Perry home, ex. neighborhood, 20 min. to NASA, \$650. Eric, 483-8920.

Lease: 2 BR, 1 BA apt. in Webster/Clear Lake, many extras, \$360. Dave, x38156 or 486-5181 or Eric, x38420.

Sale/Lease: 4 BR, 2 BA home in Alameda Mall area, many extras, \$650/mo. Herb, x38161 or 481-1253.

Sale: Hilltop Lakes resort property, 80' x 120', wooded lot w/taxiway to runway, \$6,000. 554-6201.

Rent: Friendswood/Heritage Park, new section, 4-2-2, FPL, close to new high school, avail. July 1, no pets. \$825/mo. x33574 or 482-4563.

Sale: Heritage Park, 3-2-2 home, freshly painted, ext. spa, lg. deck, FPL, stainmaster carpet, 10.5% assum., across street from pool, tennis courts and elem. school, \$69,500. x36619 or 996-0289.

Sale: Big Bend area, get away and hunting land, 160 acres, \$140/acre, CFD 20% down, 9% for 5 yrs. 337-4051.

**Cars & Trucks**

'46 Ford PU, all orig., \$3,300. 282-4593 or 331-0108.

'78 Corvette, silver anniv. edition, new 2-tone silver paint w/white int., T-tops, all power, 14K on new Vette eng., rebuilt brakes, suspension, much more, \$9,750. Richard, x30271 or 474-9334.

'76 Dodge power Ram 4x4, very good running and driving cond., new clutch, new brakes, power winch, \$3K. George, 944-9761.

'82 Chevrolet Malibu station wagon, V-6, PS, PB, \$1,900. Matt, x34285 or 486-7260.

'85 Pontiac 6000 LE, auto., V-6, PS, PB, P/W, gauges, AM/FM, \$5,700. Matt, x34285 or 485-7260.

'81 Monte Carlo, V-6, power, air, auto., AM/FM/cass., ex. mech. cond., complete service history, \$2,150. Musgrove, x38356 or 488-3966.

'86 Chrysler LeBaron, 4 DR, Zeibart pg. gar. kept, fully loaded, or assume notes, 996-9738.

'76 TRG, good cond., two tops, overdrive, \$3,125. 282-5213 or 334-1705.

'85 Camaro, V-6, auto., stereo AM/FM/cass., PS, PB, good tires, \$4,850. x37678 or 661-4789.

'76 Mercury Cougar, PS, PB, AM/FM, current inspec. sticker, runs, \$800. OBO. David, 333-6481 or 947-1631.

'71 Volvo 142E, unique restoration opportunity, fuel inj. 5-sp., cold A/C, good tires, \$750. OBO. Ken, x32782 or 488-4036.

'83 Toyota Corolla sta. wagon, 5-sp., AM/FM, \$2,800; '72 Chevy PU, 350 eng., custom hrs., AM/FM/cass., shell, \$1,100. Charlie,

x33301 or 488-1070.

'81 Camaro Berlinetta, V-8 eng., 4-sp. manual (w/OD), limited slip rear-end, tilt, cruise, power, A/C, AM/FM/cass., \$3,800. Charlie, x33301 or 488-1070.

## Cycles

'86 Honda Interceptor VFR, gear-driven cam V-4, like new, beautiful, red, white, blue, gar. kept, 1,300 mi., \$3,700. x31588 or 488-1326.

AMF 10-spd., 27", \$30. 488-6246.

'66 Triumph Trophy, 500cc motorcycle, bike restored, w/new paint and rebuilt eng., \$1,350. OBO. 996-8110.

'80 Suzuki 450 motorcycle w/2 helmets, \$600. 482-9601.

'86 Honda Shadow, VT1100 motorcycle, 6,500 mi., ex. cond., \$2,800. Flicky, x36812 or 488-9043.

'77 Kawasaki KZ400 twin, w/helmets, windshield and luggage rack, runs fine, \$400. 333-7573.



Herbert Zook, co-investigator on Galileo's DDS project, at home in Bldg. 31's Solar System Exploration Division.

# STARDUST MEMORIES

## Herb Zook plans on looking back into interplanetary time with Galileo's dust detection system experiment.

Herb Zook, planetary scientist in the Solar System Exploration Division, intends to spend much of the next eight years looking for dust. Interplanetary dust will be encountered during Galileo's roundabout 2.4 billion mile journey to Jupiter and dust in orbit around Jupiter very likely will be detected during Galileo's sojourn at Jupiter.

As co-investigator for the DDS (dust detection system) experiment which will fly aboard the Galileo orbiter, Zook will assist the principal investigator, Eberhard Grun, of the Max-Planck-Institut für Kernphysik, in Heidelberg, the Federal Republic of Germany. Current plans call for the DDS to be in operation far longer than most of the other experiments on board.

"Many of the experiments will not be activated until the spacecraft nears Jupiter, in late 1995," Zook said. "But the nature of this experiment allows us to collect very important data on interplanetary meteoroids while traversing the solar system, and the data can be transmitted back to Earth at a very low information rate. So we'll be turning the DDS on about two weeks after the October launch - and monitoring it the whole way."

The DDS was principally designed to gain an understanding of the physical and dynamic properties of small dust particles in the vicinity of Jupiter.

Shaped somewhat like a large punch bowl about 40 centimeters in diameter, the instrument includes a set of grids, electron and ion collectors for sensing the impact products of a dust particle, and methods to determine the mass and speed of dust particles entering a wide field of view of 140 degrees.

"A much smaller version of the DDS flew on the HEOS-2 (Highly Eccentric Orbiting Satellite) in the early 70s satellites," Zook said. "Since that time, there has been a great deal of research about orbital dust and debris and its causes. It is now believed, for example, that considerable interplanetary dust is generated from mutual collisions between asteroids in the main belt of asteroids between Mars and Jupiter. And further, that these dust orbits will slowly spiral in toward the sun under the influence of solar wind and radiation drag (in tens to hundreds of thousands of years).

Very recent work that Al Jackson (of Lockheed Engineering and Science Corp.) and I have done suggests that these dust grains can be 'trapped' for extended periods in orbits that are in orbital period resonance with the Earth (and to a lesser degree with Venus and Mars)". This work, entitled "A Solar System Dust Ring with the Earth as its Shepherd," was recently published in *Nature*.

Eventually these particles will escape this orbit, and continue to orbit inward toward the sun, Zook said. "We weren't looking for this trapping effect when we started to compute signs of long-term orbital evolution two years ago," Zook said. But when it became clear to me that this was happening, I petitioned those in charge of the Galileo project to allow us to turn on the instrument nearly a year early. This will allow important research to be done on the way to Jupiter, in addition to the information we will be getting during Galileo's 20 month orbit around the planet once we get there."

The launch of Galileo was originally scheduled for 1982, then later 1986, but was grounded and rescheduled again due to the Challenger accident. The original plan of using a liquid fuel rocket to propel it in a relatively 'straight shot' toward Jupiter (taking about 2 1/2 years) was changed.

The spacecraft system will now be sent to Jupiter via the shuttle, then use the solid fuel rocket Inertial Upper Stage to escape from Earth's gravity. Because the IUS is less powerful than a liquid fuel rocket, the flight path has been lengthened to 5 and 1/2 years, using a triple gravity-assist from Earth and Venus.

The new trajectory involves a flight to Venus where it will receive a grav-

ity assist, then two gravity-assist flybys of Earth before it takes up its final flight path to Jupiter. Between planets, the spacecraft will maneuver to fine-tune its approach to the next gravity assist. The new trajectory has been dubbed VEEGA, for Venus-Earth-Earth Gravity Assist.

This new flight path will also permit Galileo to fly close by two main-belt asteroids, Gaspra and Ida, the first of such visits.

In early July, 1995, the planetary probe will separate from Galileo's orbiter and travel unattended toward the planet. A trajectory correction maneuver will alter the orbiter's flight path to overfly the probe and go into orbit around Jupiter.

On December 7, 1995, a few hours before the probe begins its slow, 75-minute descent into the Jovian atmosphere, the orbiter will fly within 1,000 kilometers (620 miles) of Jupiter's moon Io to make scientific observations. Io's gravity will help slow down the orbiter in order for it to successfully achieve orbit around Jupiter, for a planned 22-month, 10 orbit journey around the giant planet.

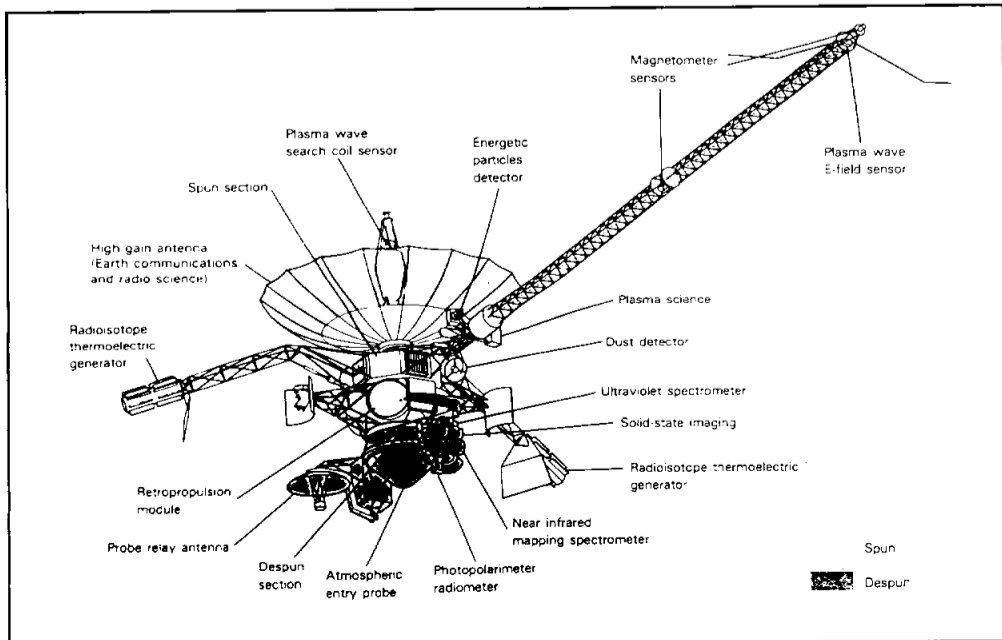
It is during this part of the mission that the DDS will be working on its primary objective, to determine the size, speed and charge of small particles near Jupiter and its satellites, just as it did during its long journey through interplanetary space.

Zook joined the Spacecraft Technology Division at JSC in 1964, and later spent four years as a flight controller on Apollo 14 through 16 and during Skylab. "Then I moved over to what is now the Solar System Exploration Division," he explained, "where I initially researched how to protect space suits against meteor impacts."

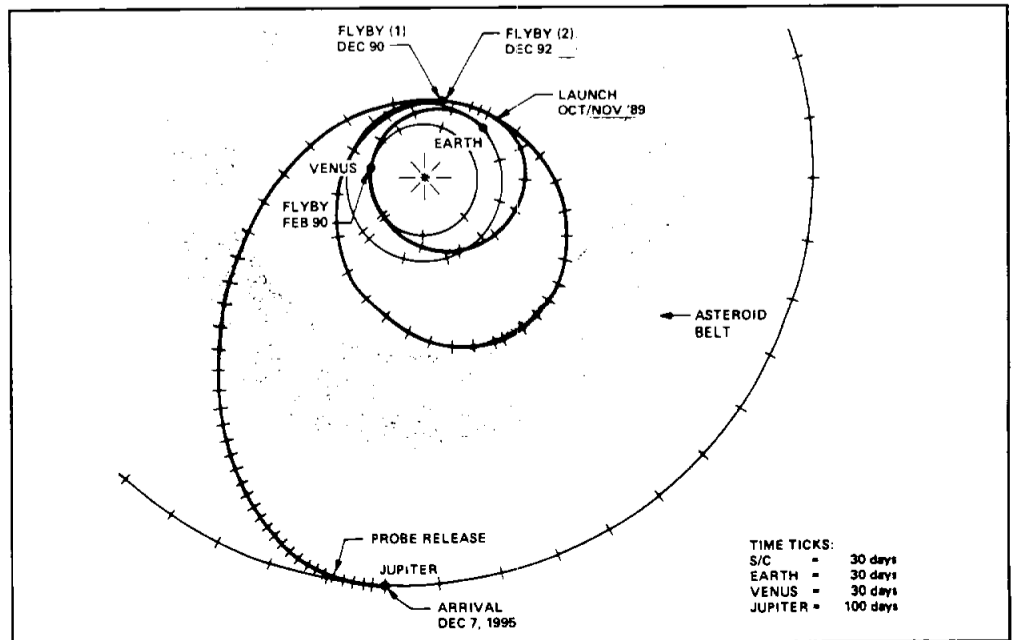
He analyzed meteoroid impacts on lunar rocks, and studied other impact processes on the lunar surface, which seemed to ease naturally into his present work with interplanetary dust.

Zook spent a year in Heidelberg, studying with Grun, and the DDS project's chief investigator spent six months with Zook in the Clear Lake area as well, while working at JSC. "That experience had some interesting side effects," he says. "Although my then twelve year old daughter had initial difficulty adjusting to an all-German speaking school, her German is now more fluid than mine."

Zook plans to be present at JPL for the DDS turn on, about two weeks after the launch, and then monitor results from his office in JSC's Bldg. 31, where he is also co-investigator for the Ulysses project, set for a 1990 launch that will eventually orbit over the poles of the sun. And that 1995 Jupiter encounter "is certainly something I plan to stay around for," he says.



Location of instruments (including the DDS) and major elements of the Galileo spacecraft, scheduled for launch aboard STS-34 in October, 1989.



Galileo's current 5 and 1/2 year, 2.4 billion mile trajectory path has been dubbed VEEGA, for Venus-Earth-Earth Gravity Assist.

# Mission update: Magellan on course for Venus encounter

A weekly status report on the Magellan spacecraft from NASA's Jet Propulsion Laboratory finds everything on track for its rendezvous with the planet Venus in August 1990.

The spacecraft continues to operate routinely, with twicedaily momentum wheel desaturations and once-a-day star calibrations. Radio calibration tests will begin this month.

Magellan engineers are periodically rolling the spacecraft 180 degrees about the Medium-Gain Antenna axis to obtain Rocket Engine

Module (REM) temperature data to update the temperature model.

Higher than expected REM temperatures will constrain use of the High-Gain Antenna and, consequently, the Deep Space Network's Very Long Baseline Interferometry (VLBI) tests during the cruise. While this is not considered to be a major problem, REM temperatures could constrain mapping operations in the first cycle of an extended mission.

Corrections made to ground attitude control software are believed to have solved an attitude knowledge problem. Updates will be added to the

flight attitude software today.

One possible result of the attitude control problem is mispointing the High-Gain Antenna on the order of one-half a degree, which results in a small loss in the downlink signal. The loss is not a problem at the present time because there is more than adequate margin in the receiving antenna. Once the attitude control knowledge problem is solved and the subsystem calibrated, a High-Gain Antenna calibration will be made to take out any mechanical or electrical offset.

A technical briefing is scheduled for

June 13 on the attitude control knowledge problem and whether to continue momentum wheel desaturations twice a day.

Currently, the Solid Rocket Motor (SRM) temperature is at 31 degrees C (87.8 F), close to the redline limit of 33 C (91.4 F) as the nozzle points closer to the sun. This is being watched closely.

Magellan has moved inward from Earth's orbit toward the sun. Shortly after launch, the spacecraft was fired by the Inertial Upper Stage (IUS) in the opposite direction to Earth's flight to slow it down so it would fall inward

toward the orbit of Venus.

In July, the spacecraft will begin to speed up relative to Earth, and, about August 1, it will have caught up with Earth so that the sun, spacecraft and Earth will be almost in a straight line. At about noon of each day, if Magellan were visible, it would be overhead with the sun in the background.

Magellan Report as of June 6, 1989  
 Distance From Earth (mi) 4,502,212  
 Velocity Geocentric 5,291 mph  
 Heliocentric 60,719 mph  
 One Way Light Time 24.2 sec

## Diaz, Hartsfield appointed

(Continued from Page 1)

NASA has set up the organization within the Space Science Office for coordinating with the Office of Space Station.

Diaz received a bachelor of science degree from St. Joseph's University in 1966, a graduate degree in physics from Old Dominion University in 1970, and a graduate degree in management from Massachusetts Institute of Technology as a NASA-sponsored Sloan Fellow in 1986. He was awarded the NASA Medal for Exceptional Scientific Achievement in 1977 for his work on the Viking experiment.

Hartsfield joined the Air Force in 1955 and is a graduate of the USAF Pilot School at Edwards AFB. He served as instructor there prior to his assignment in 1966 to the USAF Manned Orbiting Laboratory (MOL) Program as an astronaut. Upon the cancellation of the MOL program in 1969, he was reassigned to NASA, retiring from the Air Force in 1977.

Hartsfield served as pilot for STS-4 in June and July 1982, and commanded shuttle missions STS-41-D in September, 1984, and STS 61-A in November 1985. His most recent assignment was Deputy Director for Flight Crew Operations at JSC. He received the NASA Distinguished Service Medal in 1982 and 1988, and the NASA Exceptional Service Medal, also in 1988.



NASA Photo

**SPACE VETERAN**—This artist's illustration depicts Voyager 2 as it approaches Neptune and its major moon, Triton, this August. Voyager began taking about six images of Neptune every three hours this week.

## Neptune's Voyager visit approaching

(Continued from Page 1)

But Voyager 2's discoveries may not end at Neptune. The spacecraft's instruments will continue to operate as it passes out of the solar system and heads toward interstellar space. As its twin probe, Voyager 1, is now hoped to do, Voyager 2 will be tuned to attempt to record the edge of the Sun's influence and the beginning of true interstellar space.

Voyager 2's last course correction was successfully completed April 20, when the spacecraft performed a two-hour maneuver that put it on a

trajectory to pass 3,000 miles from Neptune's cloudtops. The maneuver also served as a dress rehearsal for a similar one, called a roll-turn, that the spacecraft will perform when it is only four days away from its closest approach. The roll-turn maneuver will use the spacecraft's onboard gyroscopes, rather than the propulsion system, to roll Voyager, avoiding a signal command blackout the thrusters could create.

This week, Voyager 2 has closed to less than 73 million miles from Neptune.

## TDRS constellation set

(Continued from Page 1)

Goddard's TDRS network director. "The satellite will drift about 1 degree per day and reach its permanent location on June 10."

The TDRS system will support up to 23 user spacecraft simultaneously and provide both multiple-access service that relays data from

as many as 19 low-data-rate spacecraft at the same time and a single-access service that provides two high-data-rate communications relays from each satellite. The final testing required for "service acceptance" of the total system is scheduled to be completed by the end of August.

## Columbia readied for flight

(Continued from Page 1)

rocket boosters remains scheduled for June 23. Actual mate is scheduled the next day and the rollout to launch pad 39B is scheduled for July 2.

Next week, SRB stacking oper-

ations for the STS-34 mission in October will begin in the VAB. It will be the first time that stacking operations for two Shuttle missions will be underway simultaneously since the 51-L accident in January 1986.

## Child Care Center Committee to hold membership meeting

The JSC Child Care Center Committee will hold its first membership meeting on Thursday, June 22, at 4 p.m. in the Bldg. 30 auditorium.

A slate of candidates for the planned board of directors for the facility will be presented for election at that time. The board will be the

governing body of Space Family Education, Inc., the non-profit corporation which plans to open the JSC Child Care Center in May, 1990. The board will be responsible for the operation and policy making of the facility.

Nominations for the board will close June 22, although nominations will be taken from the floor during the scheduled meeting. All members of the Space Family Education, Inc. corporation are eligible to submit nominations, either for themselves or for other members.

All JSC civil service, military, JSC Exchange, and on-site contractors are invited to join the corporation for a \$5 dollar membership fee, which covers either single or family memberships.

The groundbreaking ceremony for the facility has been scheduled for Friday, June 23 at 2 p.m. at the construction site off the corner of Second Street and Avenue B. All employees are invited to attend.

The JSC Child Care Committee is also engaging in fund-raising activities to help with the anticipated operating costs of the center, including the sale of children's sleepers and jogging suits featuring the NASA logo. For size and price information, contact Debra Adams, x31555.

For copies of the application for membership in the Space Family Education corporation, or for a board of directors nomination form, please contact Estella Gillette, x33077, or Mary Allen, x33087.

## Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office for all space center employees.

Swap Shop deadline is every Friday, two weeks before the desired date of publication.

Editor ..... Kelly Humphries

Associate Editor .... Linda Copley



NASA Photo

**JSC CYTOMETRY WORKSHOP**—Experts from throughout the United States converged on JSC last week for an Inflight Cytometry Workshop. The workshop centered on setting the design parameters for innovative equipment planned to be aboard Space Station Freedom that will be able to monitor living cells, allowing blood cell counts and immunological studies, among others, to be conducted on board.

The NASA project focuses on making large reductions in the size and time requirements of current cytometry equipment so that it will be suitable as onboard hardware.

The project is being closely watched and supported by many outside groups, and representatives of the American Cancer Society, the Memorial Sloan Kettering Cancer Center, the National Cancer Institute, Miami University, Alamos National Laboratory, Northwestern University, Foundation of Blood Research, Department of Commerce, Lawrence Livermore Laboratories, and the University of Arizona, the University of California at San Francisco were included among many other prestigious participants in the workshop.