

Family Affair

Last year the Family Affair Christmas Project raised \$3,000, enough to buy food and presents for 131 families in the Houston area.

This year the drive kicks off December 3 and runs through the 11th; the goal, \$3,500. Each Space Center building has an area coordinator who will gather the funds. (Contact Julius Mayhorn at x-3381 or mail code FD6—he will put you in touch with your representative.)

Christmas Project volunteers use the funds to buy toys and food which they pack in bundles and deliver to Houston homes. They play Santa Claus, and help make Christmas the gratifying experience it should be—both for receivers and the givers.

Charity and community action organizations in Harris County provide the names of families plus the age and sex of the children. Then each bundle is individually and personally packed and delivered, with toys for each child and a full meal with everything from a turkey or ham to the bread and butter.

Every dollar counts, and every dollar is needed.

JSC craft flies Polar Ocean

JSC's NC-130B (NASA 929) aircraft, run by Aircraft Operations personnel, returned October 19 from a four-week remote sensing mission in the Polar Ocean northwest of the Spitzbergen Island Group in Norway. The aircraft took part in an ice study referred to as Norwegian Remote Sensing Experiment (NORSEX).

Results of the experiment will be used in developing sensors for future space satellite systems that will monitor ice conditions in the Polar regions.

The experiments are international in scope involving scientists from the USA, Norway, Canada, Switzerland, and Denmark. Other NASA Centers involved are Ames, Langley, and Goddard.

Flights also went over the Greenland icecap and the Newfoundland Grand Banks. The craft flew missions as far north as 85 degrees N. latitude. In order to accomplish the flights and return to Tromso, the NC-130B refueled on each mission at Longyearbyen in the Spitzbergen Islands, the northern-most airport in the world at 78 degrees N. latitude.

Eleven JSC personnel from AOD and the Experiments System Division flew the



Photo by Dick Williamson

NC-130B crew at northern-most airport in the world

mission using JSC and Langley sensors (scatterometers and radiometers). These sensors will help define requirements for the National Oceanographic Sea Satellite.

NOSS is a follow-on for the "Seasat" Program.

The NC-130B flew 25 flights on the 28-day mission, travelling over 27,000 miles of mission and ferry flying.

It's getting hard to get a CU loan

Federal Reserve policy, liquidity laws tighten belts

JSC Credit Union loan ceilings are down roughly 50%, and auto loans have been cut out altogether, as a result of the Credit Union responding to the Federal Reserve Board's tight money policy.

New liquidity laws have compounded the problem, said Credit Union spokesman Carwin Abraham. He added that these are "all temporary measures dealing with the national tight money situation."

The \$250,000 allocated for Credit Union auto loans in November was ex-

hausted by the eighth of the month, Abraham said. The Credit Union Board met and "the situation was such that they decided not to make any more new or used auto loans," he said.

As of *Roundup* press time, no decision had been made as to an auto loan allotment for December.

Credit Union loan policy changed November 1 after the Federal Reserve Board took steps to limit the amount of money in circulation nationwide.

In addition, new liquidity laws say the

Credit Union must keep 5% of its assets in liquid reserves "where before there was no predetermined amount," Abraham said.

The Credit Union is still making signature, open end, share secure, and some home improvement loans, but ceilings have been lowered by about 50%, Abraham said.

"If we can encourage members to use their share accounts for savings, it will help," he added. "Nobody can borrow

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Glynn S. Lunney

Lunney acting STS chief of operations

Glynn S. Lunney, manager of the Shuttle Payload and Integration Development program at JSC, has been named Acting Associate Administrator for Space Transportation Systems Operations at NASA Headquarters effective November 16.

Lunney will be instrumental in forming the new office which was established as a result of the recent decision to separate STS Acquisition from Operations.

He will continue in the assignment until the position of Associate Administrator for STS Operations is filled.

Lunney joined NASA in 1959 at Lewis Research Center in Cleveland. He joined the Space Task Group at Langley, and moved with that group to Houston when the Manned Spacecraft Center was created.

He was a flight director during Gemini and Apollo and was U.S. Technical Director for ASTP in 1975. He also spent a year at NASA Headquarters in 1976-77 as Deputy Associate Administrator for Space Flight.

STS Update

The Shuttle Main Propulsion System Test article will undergo another static firing, scheduled to run 510 seconds, no later than December 14.

NASA device applied to cancer

NASA is evaluating an instrument that uses space technology to detect cancerous tumors in the human body.

The device called a microwave applicator, will also be tested for use in the treatment of cancerous tissue by heating a tumor to destroy cancer cells. The applicator has already demonstrated that it can locate tumors in 14 known cancer patients, and it has even found a can-

cerous site in one patient that was undiscovered by conventional techniques.

The microwave instrument contains a sensitive radiometer that can measure temperature variations of less than 0.2 degrees. Because cancerous tissues are hotter than surrounding normal tissue, they can be detected by the applicator.

The applicator also can detect heat differences much deeper in the body

than conventional infrared thermography.

The next step in proving the instrument will begin early in 1980 when researchers test the device's ability to treat cancer in large laboratory animals. The treatment method will involve microwave heating of a tumor area to destroy cancer cells. Temperatures higher than 107.6 F. are considered lethal to cancerous tissue.

Tumors have a poorer vascular system (fewer blood vessels) as compared to healthy tissue and contain more fluid. Researchers believe that the microwave system will heat a tumor faster than surrounding tissue because of a higher moisture content, and the tumor will stay hotter because there are fewer blood vessels to carry the heat away.

Langley Research Center, is testing the device at the Eastern Virginia Medical School at Norfolk General Hospital.

After preliminary research and development, Microwave Associates, Inc., of Burlington, Mass., which has worked with NASA for several years on aerospace projects, will develop and build the instrument.

Total funding to date, from NASA's Technology Utilization Program, has amounted to less than \$47,000.



Why are these people running? See Page 4



BACKUP CREW for the first Shuttle mission, astronauts Dick Truly and Joe Engle, leave the Orbiter Processing Facility at Kennedy Space Center after completing escape suit testing in the cabin of the Orbiter Columbia last month. (KSC Photo)

Employees earn awards

The following persons have been selected to receive NASA Honor Awards this year:

Equal Employment Opportunity Medal

Kenneth B. Gilbreath

Group Achievement Award

Interactive Financial Systems Development Team

JSC Data Processing Services Team

Phase I Shuttle Procedures Simulator Project Team

Shuttle Single Systems Trainer Development Team

Skylab Re-entry Team

Public Service Medal

Thomas R. McGetchin

Outstanding Leadership Medal

Richard A. Colonna

Charles S. Harlan

Joseph V. Piland

David L. Phippen

Exceptional Scientific Achievement Medal

Robert B. MacDonald

Exceptional Service Medal

Henry E. Clements

James E. Saultz, Sr.

Harold S. Stall

Kenneth A. Young

Sidney L. Whitley (NSTL)

James McBarron, Head of the Space Suit Section of Crew Systems, has received the Victor A. Prather Award from the American Astronautical Society. He accepted the award at the AAS 1979 Annual Conference Banquet October 31 in Los Angeles.

Jim Oberg, McDonnell Douglas Engineer in Guidance and Propulsion, and well-known UFO debunker, won the UFO Essay Competition sponsored by Cutty Sark, Ltd. (London). He accepted the prize, which included a check for 1,000 pounds, at a ceremony October 10 at the Mayfair Hotel in London. His winning paper, "The Failure of the 'Science' of UFOlogy," appeared in the October 11 issue of *New Scientist*.

Bulletin Board

Please limit announcements to 10 lines, double-spaced copy

On Sale at the JSC Exchange Store (Store Hours 10 a.m. to 2 p.m.)

Dean Goss Tickets - \$10 Single \$20 Couple (Reg. \$14.50)

ABC Theatre Tickets - \$2 each

General Cinema Tickets - \$2.40 each

Magic Kingdom Cards - Free

Sea-Arama Marineworld Fun-Time Card - Free

Entertainment 80" Coupon Book - \$15 each

Bea Brown

JSC Exchange Store

Bike Club to Participate In Bike Path Opening Ceremonies

The JSC Bike Club will participate in the formal opening of the new Kirby Road bike path on Saturday December 8. The club has just drafted its first newsletter. The next club meeting will be Monday, December 3, in the Building 350 Conference Room at 5 p.m. Additional club information can be obtained from Brian Morris, X-5293; Sheldon Tucker, X-4107; or Michael Drews, X-4326.

Hear Christmas Songs At UH/CLC

The University of Houston at Clear Lake Community Orchestra will give a Christmas concert December 2 at 3 p.m. at the Bayou Building on the University grounds. Tickets are available at the door:

Adults, \$1.50; students and senior citizens, 50¢. Dr. Charles Johnson is conductor.

Choir to Entertain At Next NARFE Meet

The National Association of Retired Federal Employees will meet at the Clear Lake Park Building on NASA Road One December 7 at 6 p.m. There will be a

covered dish dinner and entertainment by the Webster Presbyterian Bell Choir. Guests are welcome. For more information, call Henry Lehman: 482-7743; or A. B. Olsen: 334-3270. The following slate of officers will be installed: A. B. Olsen, President; Paul H. Vavra, First Vice President; Richard J. Crane, Second Vice President; Helen Aprill, Secretary; and Mary Kotanchik, Treasurer.



BIG WINNERS in the JSC Golf Association trophy competition are shown above. Kneeling are champion Mike Gremillion and runner-up Wakie Dunham. Standing are flight and Four Ball winners Bob Ross, Bill Nunnery, Rueben Taylor, and Bill Miller.

Next AIAA Meeting

"Future Applications of Computers and Their Impact on Our Lives" will be the topic of a panel discussion presented at the next AIAA meeting Wednesday December 12.

Social hour for the meeting at Gilruth Center begins at 6, dinner (baked ham) is at 7, and the program starts at 8. There is no charge to attend the program only.

For reservations (by noon Monday December 10) call Miriam at 333-2030 x-211, or Sonya at 333-6301. For further information contact Norman Chaffee at 483-3918.

James Strickland dies

James L. Strickland, who retired in 1974 from the Data Systems and Analysis Directorate, Ground Data Systems Division, died on November 16 at the age of 58.

Strickland worked for NASA at Langley and transferred to Houston in 1963 as part of the team that was to develop the Mission Control Center. His final role at JSC was as Section Head for Facilities Support in the Communications Data Support Branch.

Strickland was buried in Roseland, Louisiana, on November 19, the tenth anniversary of the second Moon landing.

NEBA FACT

The first group life insurance for employees was in 1911.

Credit Union

Continued from Page 1

until someone starts saving. We rely on share accounts for investments.

"That's what credit unions are all about."

The JSC Credit Union currently holds more than \$28 million in share account assets which are used for loanable funds at a maximum 12% interest rate.

It will take action by the Federal Reserve Board to loosen money at the Credit Union. "We're just having to tighten our belts like everyone else," Abraham said.



Awarded for improving their jobs

Above are 1979's Cost Reduction award winners: Seated from left to right: Norman Chaffee, Bernard Rosenbaum, Josephine Jue, Linda Kirbie, and Saverio Gaudiano. Standing: Donald Young, Louis McFadden, Wesley Galloway, Donald Simanton, Mike Conway, Floyd Schell, Donald Ward, Marvin Bernhard, and Samuel Weathersby.

Two awards are of special note: Linda

Kirbie's Cost Reduction report changed the memory configuration on a Univac 1110 to prevent storage crashes, saving the Data Systems and Analysis Directorate and NASA \$1,229,000.

Bernard Rosenbaum suggested NASA use a liquid nitrogen cooled freezeblock technique instead of 57 drain ports that were to be added to the Shuttle hydraulic lines. This reduced weight on the Orbiter,

eliminated 150 potential leakage points, and saved the Shuttle program \$6,957,000.

The Cost Reduction Office wants to remind employees to "stop being a silent majority." In daily management of your job you streamline and improve techniques; why not let NASA know? Fill out a Cost Reduction form and perhaps you can earn an award, just for doing your job.

Cold winter coming

Office thermostats in JSC buildings were set over Thanksgiving weekend at 65 degrees F for the winter, as mandated by President Carter.

That's cold, but that's law.

Room conditions can vary, and it is impossible to guarantee a constant 65 degrees at all times. Center Operations suggests that personnel in south-facing external offices open blinds to take ad-

vantage of the sun's heat.

Added protection for feet may be needed since floor temperatures may be as low as 55 degrees. The air handling systems are adjusted to maintain 65 degrees at thermostat height off the floor.

Any type of supplemental floor or space heater is strictly prohibited by law. More detailed information is being published.

Some suggestions

Temperatures are going down, and so are thermostats as another winter of energy conservation begins. Even though you can't add heat to your surroundings, you can keep your own body heat from escaping into the room.

Wear layers. Even thin layers of cotton will trap body heat. And as it warms up in the afternoon, you can peel the layers off.

Temperatures vary as you walk from room to room—from computers in the basement to a third floor westside office.

Those flexible layers are a big advantage. Take it off, put it on, tie it around your waste or shoulders.

Keep a sweater in your locker or drawer and add a layer when you need it.

V-necks, turtlenecks, sweater vests, and t-shirts; longjohns, long socks, leotards, and boots—use your imagination and come up with warm, practical, and chic combinations.

You can switch and mix layers in different ways and everyone will think you have an expensive new wardrobe. Plus you'll be warm.

What's cookin' in the cafeteria

Week of December 3 - 7

MONDAY: Chicken & Rice Soup; Texas Hot's & Beans; BBQ Ham Steak; Steak Parmesan; Beef & Macaroni (Special); Green Beans; Carrots; Au Gratin Potatoes.

TUESDAY: Tomato Soup; Potato Baked Chicken; BBQ Spare Ribs; Mexican Dinner (Special); Squash; Ranch Beans; Spanish Rice; Broccoli.

WEDNESDAY: Clam Chowder; Baked Turbot; Liver & Onions; BBQ Ham Steak; Baked Meatloaf w/Creole sauce (Special); Beets; Brussels Sprouts; Green Beans; Whipped Potatoes.

THURSDAY: Beef & Barley Soup; Chicken & Dumplings; Corned Beef w/Cabbage; Smothered Steak w/Cornbread dressing (Special); Spinach; Cabbage; Cauliflower au gratin; Parsley potato.

FRIDAY: Seafood Gumbo; Pork Chop w/Yam Rosette; Creole Baked Cod; Tuna & Salmon Croquette (Special); Brussels Sprouts; Green Beans; Buttered Corn; Whipped Potatoes.

Week of December 10 - 14

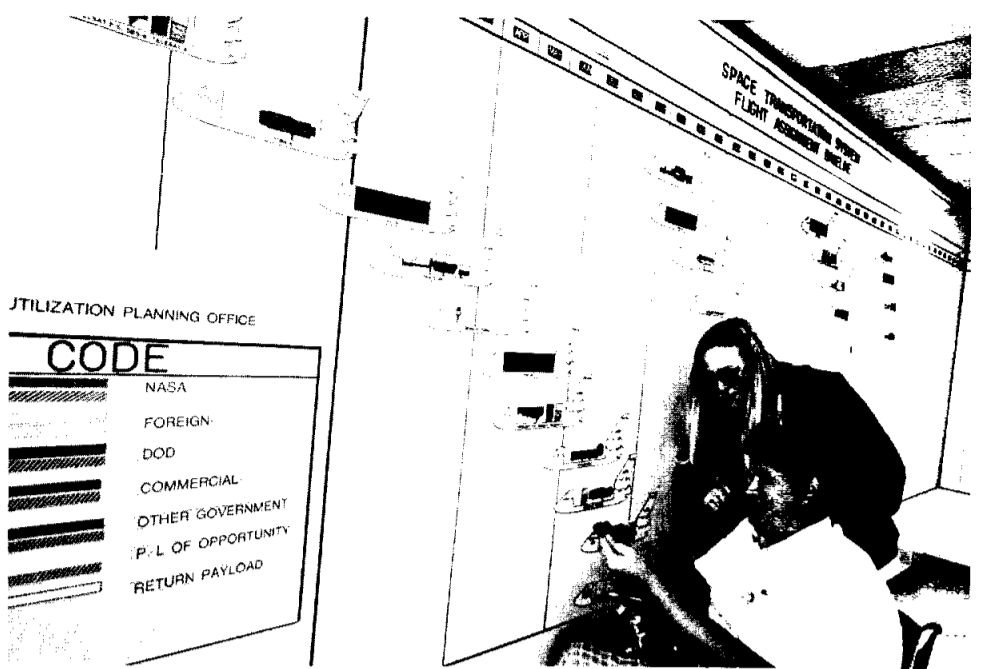
MONDAY: Cream of Celery Soup; Braised Beef Ribs; Chicken a la King; Enchiladas w/Chili; Italian Cutlet (Special); Brussels Sprouts; Navy Beans.

TUESDAY: Beef & Barley Soup; Turkey & Dressing; Country Style Steak; Beef Ravioli; Stuffed Cabbage (Special); Corn Cobette; Okra & Tomatoes; French Beans.

WEDNESDAY: Clam Chowder; Catfish w/Hush Puppies; Roast Pork w/Dressing; Chinese Pepper Steak (Special); Broccoli; Macaroni w/Cheese; Stewed Tomatoes.

THURSDAY: Cream of Tomato Soup; Beef Tacos; BBQ Ham Slice; Hungarian Goulash; Chicken Fried Steak (Special); Spinach; Pinto Beans; Beets.

FRIDAY: Seafood Gumbo; Liver w/Onions; Deviled Crabs; Roast Beef w/Dressing; Seafood Platter; Tuna & Noodle Casserole (Special); Whipped Potatoes; Peas; Cauliflower.



ON THE BOARD—Roy Watson and Wanda Hamblin, Rockwell employees, update Shuttle payloads on the STS Flight Assignment Baseline Board located in Building One on the seventh floor.

How to get published

Articles and notices turned in to *Roundup* are more likely to run without error if you follow these guidelines:

- Type and double space with 60-characters per line.
 - Deadline is the first Wednesday after publication.
 - Notify the editor by Monday before deadline about articles (other than Swap Shop or Bulletin Board) so they can be put in the budget.
 - Copy will be edited for clarity and space. (Even Hemingway and Steinbeck had to put up with editors editing; even editors have to put up with other editors editing...)
 - SWAP SHOP ADS: Please follow instructions. The limit is 20 words per person per issue; Type or write legibly on a full sheet of paper; COB the first Wednesday after publication is deadline—no exceptions.
- Ads that do not fall in this framework will not run.
- Finally—photos, artwork, and articles are always welcome.

DON'T BE SQUARE



COST REDUCTION OFFICE BE-3

Cartoon by Russ Byther

CarShare

Call 227-0003 to get on their list.

Roundup Swap Shop

Property & Rentals

Lease: Dickinson, 4 bdrm, 2-1/2 bath, fenced back yard in Dickinson Pines. La Marque. 938-7743 after 5.

Lease: 3-1 1/2-2, behind Alameda Mall. 486-8276 after 5:30.

Rent 4-2-2 Camino South, available Dec. 1, \$485/mo. Lyon 333-6418 or 488-6219.

Sale: Perfect for active family, 4-3-2, 5-1/2 acres, pool, trees, barn, no flooding, financing available. 331-8418.

Lease: Heritage Park, 3-2-2, new house, available immediately. \$475/mo + deposit. 482-6609 after 4:30.

Lease: Sagemont, 4-2-2 with formal living room, dining room, and den, also pool. Kitchen appliances and built-ins, \$475 plus deposit. 481-2229 or 473-6738.

Rent: Galveston West End, 2 bdrm, By-the-Sea condo, furn. \$210/week off, \$280/week in season. Clements 474-2622.

Sale: Waterfront lot, Rayburn Reservoir, 140 x 120, boat launch, hunting rights, \$11,000. Owner will finance. Robinson X5549 or 487-4967.

Lease: Miramar/Seabrook, 3-2-2, fenced, new carpet and drapes, \$395/mo, + deposit. 334-1115 or 697-4751.

Sale: Glenbrook area, 2000 sf, 3-2-2, fireplace, new roof, furnace, A/C, dishwasher Pasadena schools, trees, quiet street, dry, \$79,500, Owner 649-0396.

74 Double-wide mobile home 26 x 60, 3 bdrm, 2 bath, 1560 sf. Owner will move to your lot. 333-2636 after 5.

Getaway Special. Come roast your chestnuts on an open fire. Bolivar Beach cabin on Gulf. \$35 per day. Horton X5266.

Custom English, New or perfect inside and out. Formals, 4-2-2 wooded lot, beautifully landscaped. High & dry. \$69,900. 534-3113.

Cycles

26" Boys 10-speed. Sears. Good cond. \$25. 481-6074.

Stereos & Cameras

Minolta Rokkor 35 mm, F2.8, wide angle lens, like new condition, \$80. Sanders X3458 or 481-6928.

Stereo With AM/FM radio—all housed in two blond cabinets \$20 per ear. Rubenstein X3116 or 334-2354.

Cars & Trucks

78 Ford van, 38,000 miles, dual a/c, PS/PB, many factory extras, \$6,500. Robinson X5549 or 487-4967.

71 Toyota Corona MK 2, 30 actual hwy MPG, 94,000 mi, Jeff X7429 or 488-5393.

79 Sedan deVille in warranty, 10,000 miles, \$12,000. 488-1460 or 488-6680.

76 Ford LTD S/W, 351 V8, all power, AM/FM, A/C. La Marque 938-7743 after 5.

77 Chevrolet 1/2-ton Custom Deluxe 10 pickup, auto, A/C, PS, AM, deluxe wheels, low mileage, \$3900. 488-2716 after 5.

Sale: House trailer, 10 x 50, 2 bedrooms. Must be moved. \$5500. 485-4995, evenings.

1974 Olds Omega. 2-door. 6-cylinder. exc. running cond. \$1,175. Johnston. 481-4808 or X3503.

Credit Union Repossessions:

1978 Comanche Renegade Boat, 115 HP Evinrude with auto tilt, McClain Trailer, Price \$3500

1975 AMC Matador Car, Price \$995.

Motor Cycle, 1979 Honda CB 750, 800 miles, Price \$3000

Motor Cycle, 1979 Honda, GL1000, Price \$4600

Call Doris Feaster at the credit union telephone number 488-4572.

Musical Instruments

Reynolds trombone/case, exc cond, used one season, \$175. Patterson X2237 or 991-0788.

Boats & Planes

15' Del Magic tri-hull boat, walk thru windshield, 50 hp Mercury elec, start, tilt trailer, Never stored outside. X7241 or 944-9583 after 5.

14' Sr. Dolphin—for clear sailing to many hours of relaxation. I am not jib-ing you. Rubenstein. 334-2354.

Wellcraft '78 V20. 470 Mercruiser. SS Prop. VHF. Exc. \$7900. 471-5396.

1975 Skyhawk. 1/4 interest. Based LaPorte. 1978 Narco IFR avionics, Century II autopilot, 2200 TT w/300. on new RAM 160 conversion. \$7,000. Pruet X4491. 487-3857.

Pets

Free to good home, one year old, spayed German Shepard mix. All shots, friendly with children. Jeff X7429 or 482-5393.

AKC Cocker Spaniel puppies, ready for Christmas, \$125, Doug X3561 or 334-2179 after 4.

Wanted

Hewlett-Packard 35 calculator w/AC powerpack or AC powerpack for HP35 calculator. Drews X4326.

To buy fur pelts; raccoons, nutria, muskrat, coyote bobcat, fox, opossum, etc. 488-2276.

Carpools

Want to join or form carpool from south Alvin area. Duty hours 8-4:30 (can change), non-smoker with 77 Monte Carlo. Ferguson X5536.

Our 3-person carpool is looking for a fourth person. We leave from Eagle in Sagemont at 7:35 and return around 5:30. Our group works in Bldgs 1 and 2. Interested? Louis X4241.

Want to join or form carpool from the Sagegen-Sagemont area, 7:30-4:15. Smith X3105.

Want a ride to and from JSC (7:30-4) from Huntington Drive in Pasadena, TX. will pay, Jesse X3647 or 743-0410.

Personals

Need center for our intramural basketball team (with EAA card) (would prefer an all-American). McBride X2222.

The Clear Lake Emergency Medical Corps seeks volunteers, 18 years or older for community emergency medical service. 488-0663.

Clear Lake City Volunteer Fire Department seeks men and women 18 years or older for community service. For info call 488-0023.

Miscellaneous

Men's LCD wristwatch w/stopwatch, \$15. Old Xmas stamps at face value. Jeff X7429.

195 and 190 cm Fischer snow skis w/Cubco bindings, \$25/pair; Buckle boots, men's size 9-1/2, ladies' size 7-1/2, \$20/pair. 488-5954 after 5.

1.25 carat pear-shaped solitaire, \$4500 appraisal; negotiable. 488-1460 or 488-6680.

Solar Powered Acoustic Accelerator used for limited bathroom tile testing. a spec. shift RMS of 2 with 10 db down at 16 Hz. McCutchen X5996.

Steel shelving, \$10. 331-0608 after 5.

Harley Davidson Electric Golf Cart, good cond, \$550. X4136 or 482-4600.

Oak seedlings, grown from acorns sprouted in yard, 50¢ to \$1 per pot. Merriam X2855 or 488-3806.

Tire. New GR 70-15 steel belted radial. Whitewall. 40,000 mile original guarantee. Cost \$85, sell for \$45. Steve X3212.

Firewood. \$30/half cord. Delivered and stacked. Jost X6134.

Household Articles

Contemporary walnut bookcase headboard, 7ft., \$25; walnut coffee table, 5 ft., \$25. Both exc cond. Bocking X3358 or 333-2516.

Dining room, harvest table, w/pads, 2 deacon benches, hutch, fruitwood finish, \$400. Forsyth 534-3113 after 5.

30-inch electric, double-oven range; deluxe features. \$150. 333-3541.



Pecan Harvest 1979



Lunar science debates go on

"Looking at sample #78236 we see a high degree of shock metamorphism. It appears that 4.18 billion years ago a significant amount of cratering, or a 'large event' occurred."

"There's no reason we can't have norites with a range of ages."

"I'm not arguing that, but they're all around 4.18 billion years old."

November 14-16 over a hundred scientists from around the world gathered at the Lunar Planetary Institute for a "Conference on the Lunar Highlands Crust."

LPI holds two such topical conferences and six to ten workshops a year, as well as the annual Lunar and Planetary Conference. At the Highlands Crust sessions, scientists focused on petrology, chemistry, and chronology of lunar high-

land rocks; regional characteristics; physical processes of highland crust evolution; models for the formation of the crust; and the lunar crust in a planetary context.

"The more we study, the more we find we don't know," said JSC's John Minear during a break in the conference. "For instance we have understood planetary evolution to be a simple process—the heavy elements settled while the lighter floated to the top.

"We're now seeing that motion of fluids, the mixture of crystals, liquids trapped in solids—all have a profound influence.

"We're just beginning to touch on the physics of how things crystalize."

JSC's Norman Hubbard joined in. "A

few years ago we were meeting on the mares (lunar seas). It took more years to understand the highlands. These rocks are difficult to study. They're fragmented."

"By studying the lunar rocks, we're able to study early planetary crust," Minear added. "Most of that on Earth was destroyed 200 million years ago."

How many more years will scientists meet to compare studies on the Moon samples? "Indefinitely," Hubbard said. "It will go on and on."

Back in the Beckner Room the group is preparing to move from chemistry to physics after one more question: "Why does the iodine have to be ancient? Couldn't it be in the reservoirs?"

"Yes, but then you have the reservoir problem. . ."

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

Writer/Editor: Kay Ebeling

New Frontiers

"The road to the stars has been discovered none too soon. Civilization cannot exist without new frontiers. It needs them both physically and spiritually."

—Arthur C. Clarke

Pioneer data revealing details of Saturn

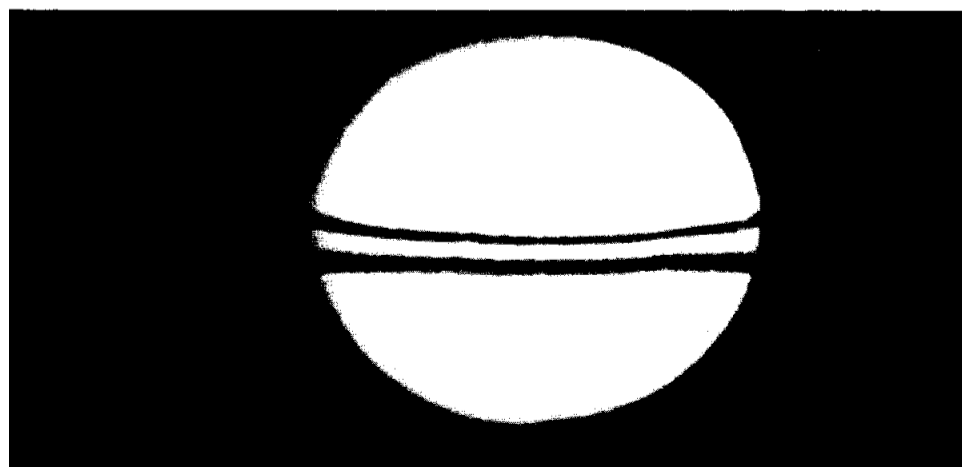
NASA's Pioneer 11 space probe is now heading out of the solar system, continuing to work well after flying past Saturn last September.

Pioneer can return useful data until the late 1980s when it reaches the limit of its radio contact with Earth.

After the closest approach September 1, Saturn's gravity swung the spacecraft almost 90 degrees on a change of course toward the edge of the solar system.

Some major findings about Saturn as a result of the mission are:

- Saturn has a 12th moon with a diameter of 170 km. It lies within the outer F-ring, and revolves around the planet every 15 hours.
- A "new ring," 8,000 km. wide, has been discovered in the region adjoining and outside the F-ring.
- There is possibly a 13th moon, but work is going on to resolve the question.
- Saturn has an 11th moon, 1979S1, with a diameter of 450 km.
- Saturn has a magnetic field, magnetosphere, and radiation belts, joining Earth and Jupiter as a magnetic planet.
- Evidence for the possibility of life on the Saturn moon Titan was discouraging, but the idea was not eliminated.



- The ring mass has a low density, which suggests it is made up mostly of ice.
- A substantial glow of atomic hydrogen was found around the rings which suggests dissociation of water ice caused by absorption of protons from the radiation belts.
- Saturn is flattened about 10% at the poles by its rapid rotation.
- The planet's core, extending about 13,800 km from the center, is about twice the size of Earth, but it is so compressed by Saturn's huge mass that it contains

- about 11 Earth masses of material, largely iron and rock.
- Above the core, out about 21,000 km, the planet consists of liquid metallic hydrogen, a substance which does not exist on Earth.
- Two and a half times more heat is radiated into space by Saturn than is absorbed from the Sun. One interpretation is that most heat is being generated by denser helium sinking through the planet's liquid hydrogen interior.
- Saturn's magnetic field is 1,000 times stronger than Earth's and 20 times

weaker than Jupiter's. Its north-south axis lines up with the planet's rotation axis, unlike the 10 degree tilt to the rotation axis of Earth, Jupiter, and the Sun.

- The planet has radiation belts made up of high energy electrons and protons which are comparable in intensity to those of Earth, although they occupy a region about 10 times larger.
- Saturn's rings completely eliminate the radiation belts. The high energy particles mirror back and forth between Saturn's poles about once a second, finally striking ring material which absorbs them. The rings are thus the most radiation-free sector of space yet found in the solar system.
- The moons Janus, Enceladus, and Tethys also absorb large numbers of radiation belt particles.
- Saturn's cloud tops, unlike Jupiter's, have few details.
- There appear to be jet streams around 70 degrees latitude.
- Ames Research Center in Mountain View, California, is project manager for the Pioneer program. The spacecraft was built by TRW.
- More information on Saturn will arrive at Earth when Voyager One flies by the planet in November 1980, and again with Voyager Two's encounter in August 1981.