

# Man's Longest Space Venture Successfully Completed!

## ROUNDUP



NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS

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The Skylab 4 crew is home again after successfully completing man's longest journey into space—84 days, 1 hour and 16 minutes.

William C. Schneider, Skylab Program Director, stated that because of the hard work of a great number of people, Skylab was able to achieve much more than was expected.

The crew completed 39 EREP passes although only 30 were planned. Four solar inertial passes were completed; only 2 were on schedule. All of the corollary and student experiments were accomplished. Also more hours were spent on major medical experiments than on any other mission. In the area of ATM, 338 hours of solar observations were completed. The Comet Kohoutek received 13 separate observations by the ATM and 111 observations by other instruments.

Alan B. Shepard, Chief of the Astronaut Office and the first American to venture into space reflected, "Back in '59 and '60 when there was a great deal of

cynicism about men in space, it would have been difficult to believe we could make the strides we've made in this short period. I think we've accomplished much more than even the most optimistic of us would have predicted at that particular time."

Shepard said that the majority of the accomplishments were made because "man has been the factor in the loop."

"Not only the crews in the spacecraft, but the crews on the ground have been able to exercise their judgement in engineering to bear on the problems that have occurred. I don't think that we would have been able to make the progress that we have without the imaginative and flexible element of man." Shepard stated.

Schneider added that Skylab's greatest achievement was to prove beyond a doubt that there is no limit in our space research.

"Just like anything else that America sets out to do, the limit is only our resolve, not the ability of men to work, and not our technical knowledge.



WELCOME HOME SL 4 CREW—Dr. Kraft welcomed the SL 4 crew when they arrived at Ellington Air Force Base last Sunday. Behind Dr. Kraft are the astronauts and their wives. From left to right are Pogue and wife Helen; Gibson and wife Julia; and Carr and wife JoAnn.

## Upward Mobility Program Begins

JSC recently developed a Career Mobility Program to provide "bridging positions" for lower graded employees who show potential and motivation for higher level jobs.

The Program identifies jobs which are "stepping stones" from clerical to professional occupations, and provides management with a source of high potential trainees who want to be placed in these positions.

Trainees in the Career Mobility Program which began February 3, include Jean Brown, Audrey Lemons, Peggy Zahler, Brenda Traylor, Margaret Fay Henry, William Scott, George Gaffney, Tom Richards, Jean Taylor, Kathryn Harvey and Sandra Smith.

JSC Personnel Officer Jack Lister said that the number of

applicants to the Program was "astounding."

Most applicants were required to apply through a JSC Career Opportunity Announcement; others were chosen by RIF (Reduction In Force) Re-promotion.

Selections were made by a panel appointed by the Personnel Officer and the Director of the area in which vacancies existed.

Factors considered in the selection of trainees include motivation and potential; performance appraisals from current and past supervisors; demonstrated interest in self-development; and work experience.

Trainees were assigned to the program at their present grade levels and will be promoted at the end of one year of training if performance is satisfactory.

The success of the Career Mobility Program depends on careful implementation of individual training plans developed by the responsible division and approved by the Program Coordinator and the Training Officer. Billy Schmidt, Program Coordinator, said that some adjustments to the plan will be acceptable, based on the degree of the trainee's progress, the activity within the office at any one time and the background of the trainee.

At a recent meeting held in Building 2, Jack Lister told the trainees, "I hope this is the start of something big for each of you."

Billy Schmidt said there is a possibility that another training program will begin in about six months.



AN OVERHEAD view of the Skylab space station cluster in Earth orbit as photographed from the Skylab 4 Command and Service Modules (CSM), during the final "fly-around" by the CSM before the return home.

## NASA Scientists Make New Discoveries

NASA Scientists have uncovered more evidence that life on the primitive Earth may have been triggered by the chemical evolution of non-living matter.

In studies to find links between living and non-living matter, a team of researchers has discovered 17 varieties of fatty acids in two meteorites examined at Ames Research Center, Mountain View, Calif.

The fatty acids are similar to those used by plants and animals to produce even more complex biological molecules, and are commonly found in household staples such as milk, margarine, fruits and vinegar.

The fatty acids were found in tiny samples of the Murray and Murchison carbonaceous meteorites by Dr. Keith Kvenvolden, chief of the Chemical Evolution Branch at Ames, and Dr. George U. Yuen, now with the Department of Chemistry at Arizona State University.

taken from the inside of the meteorites under scrupulously clean laboratory conditions, the chances that the acids are the result of terrestrial contamination are remote, according to the researchers.

Some of the basic building blocks of life have been produced in the laboratory by other scientists. In these experiments, energy was applied to a mixture of chemicals such as methane, hydrogen, ammonia and water, which is thought to be similar to the atmosphere of the newly-formed Earth. The product of the experiment was a mixture of relatively complex molecules, including simple amino acids and at least nine of the 17 fatty acids isolated by Knenvolden Yuen.

The family of simple carbon-hydrogen acid molecules found in the meteorites has counterparts in biologically-formed Earth materials, but they have

(Continued on Page 2)



CHIEF COUNSEL'S MEETING—JSC Director, Dr. Christopher C. Kraft addresses the opening session of the NASA Chief Counsel's meeting hosted by JSC January 28-29. The 2-day meeting was attended by 29 legal counselors from Headquarters and other NASA Centers. Various topics concerning effective legal service to the entire agency were discussed. Immediately to Dr. Kraft's left are NASA General Counsel, R. Tenney Johnson and Deputy General Counsel, S. Neil Hosenball. Porter H. Gilbert, JSC Chief Counsel is to Dr. Kraft's immediate right.



TWO SKYLAB 4 crewmen are seen passing trash bags through the trash airlock of the Orbital Workshop of the Skylab space station. The trash airlock leads to the OWS waste disposal tank. Astronaut William R. Pogue, Skylab 4 pilot, holds onto the OWS crew quarters ceiling as he prepares to jump onto the airlock hatch cover to force another trash bag further down into the airlock. Astronaut Gerald P. Carr, Skylab 4 commander, is assisting. Carr is holding onto two trash bags. A third trash bag is floating in the zero-gravity environment near Pogue's right leg. The wardroom can be seen behind Pogue.

### Schmitt Assists In Energy Efforts

Scientist-astronaut Dr. Harrison H. Schmitt has begun an assignment as special assistant to the Administrator to coordinate NASA's effort in energy research and development.

On his temporary duty, 90-day assignment to headquarters, he will function as the focal point of NASA's energy-related work and will facilitate NASA aid to other agencies working on energy research and development.

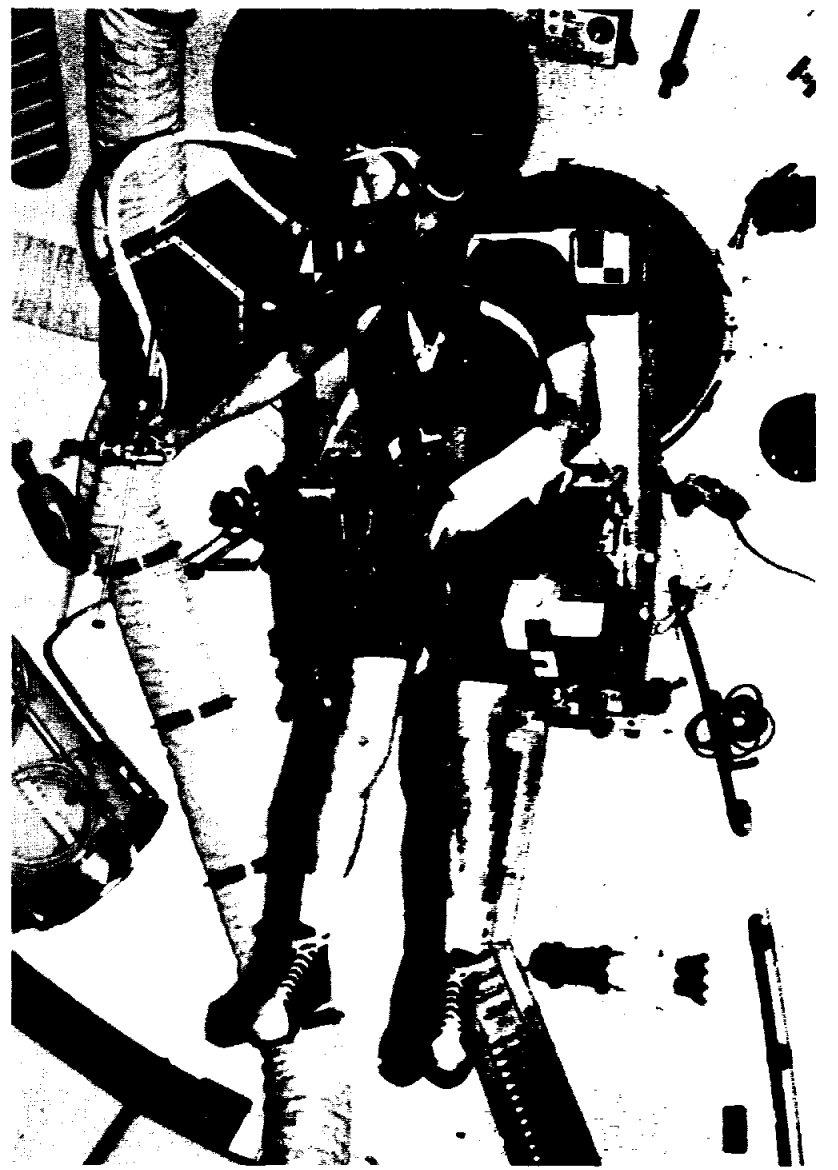
A geologist, Dr. Schmitt, who was lunar module pilot on the Apollo 17 mission, is Chief of the Astronaut Office, Science and Applications Directorate at JSC.

### Discoveries—

(Continued From Page 1)

never been found in non-organic sources like rocks. The mystery is how an extraterrestrial rock, a meteorite, could contain these materials which are basic to the biology of plants and animals.

Though the total amount of the substances examined is extremely small—a ton of similar meteorite material might yield a half-pound of the fatty acids—their existence is a new clue to how the evolution of non-living chemical compounds has provided nature with the essential building blocks of living materials.



ASTRONAUT Gerald P. Carr, commander of the Skylab 4 mission, flies the Astronaut Maneuvering Equipment M509 Experiment in the forward compartment of the Orbital Workshop of the Skylab space station. The M509 experiment consists of two jet-powered astronaut maneuvering units, a back-mounted, hand-controlled unit called the automatically stabilized maneuvering unit (ASMU), and a hand-held maneuvering unit (HHMU). Carr is holding the HHMU in his right hand. The M509 objectives are to: demonstrate AMU flying qualities and piloting capability; test and evaluate system response; and relate the data and experience gained to ground-based analysis, future AMU design requirements and projected extravehicular activity.

### AIAA Gets Awards

The Houston Section of the American Institute of Aeronautics and Astronautics (AIAA), composed largely of JSC and contractor employees, recently received the National organization's "Best Section Special Event Award" and the "Best Section Award" for the 1972-73 year.

The "Best Section Special Event Award" was presented for the Section's co-sponsorship of a conference on "Rapid Mass Transportation for the Houston-Galveston Area."

The "Best Section Award" was given in recognition of the Houston Section's comprehensive program of service to its members, the academic community and the public.

### Win A Prize!

Want a chance to win a new stereo, tape recorder, calculator, or perhaps a bag of silver?

Credit Union members who attend the organization's 12th annual meeting on February 22 at 7:00 p.m. in the Building 1 auditorium will be eligible to win these prizes—simply by registering at the door.

Official Credit Union Business will be discussed at the meeting and board members and credit committee members will be elected.

There will also be entertainment suitable for all ages. Plan to attend the meeting.



EARTH TERRAIN PHOTO—A vertical view of the Gulf of St. Lawrence area of Canada as seen from the Skylab space station in Earth orbit. The elongated island is Anticosti Island which points toward the west. The rounded coastline in the southwest corner of the photograph is Quebec's Gaspé Peninsula. The St. Lawrence River which drains the five Great Lakes empties into this body of water.

### Tickets Available

Tickets are still available for NASA Night at the Balinese Dinner Theatre in Galveston on February 27. The play is an Abe EINHORN comedy entitled, "Agatha Sue, I Love You."

Tickets are \$6 and may be purchased from Mary YARBROUGH, Bldg 2, Rm 707.

### JIMMY WARREN MEMORIAL BOWLING LEAGUE

TEAM	STANDING	WON	LOST
Chokers	47	25	
Pin Pounders	42	30	
Spoilers	40½	31½	
Ball Busters	40	32	
Associates	37½	34½	
Strikeouts	37	35	
Ascenders	36	36	
Hexes	35	37	
Alley Oops	35	37	
Team X	34½	37½	
Mixers	31	37	
Jokers	30	42	
Hertz	27	41	
Clowns	28½	43½	

### INDIVIDUAL SCRATCH HIGHS

GAMES	SET	NAME
224	579	Bill Moon
	575	Dan Kennedy
220	561	Carl Grimm
211	556	Aldo Bordano
205	547	Cal Yingling
	540	Armstrong
210	-	A. O. Bankey
204	-	Jim Liput
202	-	John Lottinville



OUTSTANDING SECRETARY—Gail L. Grow has received the Outstanding Secretary Award for February. She is secretary to Joseph Piland, Director of Center Operations. Dr. Kraft presented Gail with a plaque and a check for \$100.

## Outstanding Secretary Chosen For Feb.

Gail L. Grow recently received the "Outstanding Secretary" award for February. She was presented a plaque and a check for \$100 by Dr. Christopher C. Kraft, JSC Director.

Gail serves as secretary to Joseph Piland, Director of Center Operations. As one of JSC's major organizations, this directorate is responsible for a highly diverse group of functions and technical disciplines.

Gail's extensive knowledge of the Center and the Center Operations Directorate, along with her ability to assess situations and make appropriate judgments, has permitted Piland to assign her a number of special tasks requiring independent actions and decisions beyond normal clerical assignments.

Gail's competence under pressure, Piland says, is a major factor in the successful accomplishment if time-critical action

items.

"The quality of Gail's performance remains superior to any I have seen in 30 years of federal service," Piland states. "I regard her technical expertise on documentation preparation as authoritative. Her ability to assess the accuracy, clarity, and technical content of the wide variety of documents we process has been of immeasurable benefit to my own workload."

Gail was employed for several years in the Administration Directorate before joining Center Operations. In both areas she has been exposed to many sensitive documents and discussions, and has treated such information with utmost discretion.

"Mrs. Grow is one of this Directorate's key people and her dedication and efforts are a major factor in the conduct of our operations," Piland adds.



INMATES STUDY ROCK SAMPLES—Inmates from the Texas Department of Corrections, Darrington Unit in Rosharon, Texas observe Lunar Samples. JSC's Space-Mobile project made it possible for the men to learn more about the Space Program.



# Roundup Swap-Shop

Swap Shop advertising is available to JSC and on-site contractor personnel. Articles or services must be offered as advertised, without regard to race, religion, sex or national origin. Ads should be 20 words or less, including home telephone number. Name and office code must accompany, but need not be included in ad copy. Typed or printed copy must be received (AP3 Attn: Roundup) by Thursday of the week before publication.

### HOUSEHOLD ARTICLES

Upright Freezer, 6 mos old, 20 cu ft, copper-tone, frostfree, 3-yr service policy included, \$225, 332-3846 aft 6 p.m.  
 72" Krohler sofa, xint cndn, 474-4885.  
 Stereo 75 w amplifier, 2 10" acoustical sound hardware walnut cabinets, 8-track reel tapedeck all transistor w/automatic reverse and 2 mikes, retail value, \$550, sell for \$295, will finance, 479-7815 or X-3121.  
 7.65mm Erma Baby German Luger pistol, xtra clip, ammunition, Brand new, \$60, Kilpatrick, 534-4603.  
 Contemporary triple dresser w/mirror, xint cndn, \$50, 333-4184 or X-4588.  
 Early American Sofa, Easy chair, maple twin bed, two mattresses, two box springs, blond coffee table, \$200 or negotiate separately, 483-2141 or 471-3025 aft 5 p.m.  
 Oval dinette table with leaf and 6 chairs, 1 1/2 years old, paid \$180, make offr, 488-6874 aft 5 p.m.  
 Frostless 15 cu ft Signature refrig-freezer, 2-dr over-under. Runs prfct, Coppertone finish, fair cndn, \$75, 474-2041.  
 Living rm sofa, early American, green 100" xint cndn, \$65, 946-7277.  
 Hi-fi Dynaco 70 w amp, PAS 2 preamp & Sherwood FM tuner, \$125, Burt 333-2117.  
 23" Magnavox color tv, table model w/roll-around stand, 6 yrs old, still in working cndn, \$75m Stagg, x-2497 or 481-3086.  
 65 Kenmore washing machine, 3 cycle, 2 water levels, 5 temperature settings, \$20, Lisenbee, 487-0360 aft 5.

### VEHICLES

Honda 50 minitrail, xint running cndn, \$90, Polly, 2021 or 488-0192.  
 71 Toyota Celica, 4 spd, air, radio, loaded, xint cndn, \$2,300 Green, X-5111 or 331-3001.  
 Olds 88 Custom, 70 47k mi, 4-dr Sedan, new tires, cruise control, clean, Newman, 488-4370 or X-7272.  
 1970 mobile home, 2br, 1 bath, 12 x 65 unfurnished, \$4,200, Becky, 339-2267.  
 66 Dodge Dart parts, slant 6 engine, \$100, auto trans, \$75, complete factory air, \$75, left front door, \$10, radio, \$15, front fenders and grill, \$25, 488-1966.  
 69 Chrysler Newport, 4 dr, auto, fact air, radio, ps, 16mpg, \$725, 488-4453.  
 Two girls 26" bikes, one English racer, one Sears 3-sp, \$20 ea, 941-2325.  
 72 Montesa, 125 cc, Motocross cycle, runs great, trophy winner, \$300, 482-2589 aft 5 p.m.  
 70 Ford LTD Station Wgn, completely e-

quipped, vry gd cndn, 59,000 mi, Granger, 482-6638 or x-3751.  
 61 Triumph TR3, mds body work, mechanically gd, \$300, 333-3712.  
 Dunebuggy, Corvair, Calif. Custom 30 MPG, Bullock, 488-6095.  
 73 Vett cp, air, AM/FM stereo, auto trans, 350 cu in, 20,000 mi, \$5800, 747-3090 aft 6.  
 Boy's 20" "Spyder" bike, gd cndn, \$12, Smith, 488-3238.  
 For rent, Jayco hardtop, foildown camper, kitchen, ice-box, sleeps 8, low profile, pulls easy, \$10/day, \$57/wk, \$25 minimum, Kilbourne, 482-7879.  
 70 Olds Cutlass S, 2-dr, ht, pwr, air, auto, McPhillips, 337-1471, \$1,400.  
 Two 26" girls bikes, \$7.50 ea, 337-1471 or 337-1484.  
 72 Cadillac Coupe De Ville, wh wi wh vinyl top, red leather interior, fully equipped, incl AM/FM stereo and tape, li nw.  
 72 Mazda, RX-2 4-dr Sedan, 4 sp manual, air, 16,000 mi, 482-1625 aft 5:30.  
 67 Honda CL160 wi windshield, 11,000 mi by adult rider, vry gd cndn, no dents, \$250, 488-3265.

### PROPERTY AND RENTALS

For rent, lovely 2-yr-old brick 3-2-2 home, large den wi fireplace, carpeted, built-ins Central air, 3/4 acre lot in Alvin, 331-5026.  
 CLF by owner, 4 1/2/2 contemp, cul-de-sac, trees, irg den, fireplace, 2200 sq ft \$10,000 equity, plus \$35,000 at 7 1/2 percent 4118 Willow Hill, 334-1878 or 483-6355, Corcoran.  
 Lake Livingston resort/retirement home 3-2-1, attractively furnished, Cape Royale area, weekly, monthly, yearly rates, (rental) 488-4487.  
 Townhouse, 2-2 1/2-2, 2 story unique floor plan, custom drapes, fenced courtyard, pool, Sagemont, \$30,500, 481-4664.

### PETS

Three male Lhasa Apso puppies, 7 weeks, \$80 ea, Cox, 333-3950.  
 Cute silver toy poodles puppy, 7 wks old, AKC, registered, \$60, 471-4539.  
 Free German Shepherd, loves kids, all shots, obedience school'd, 481-4196.  
 Miniature Poodles, white females, 2 mos old, black males, 6 wks old, AKC pet and show qualities, \$75, up, Godeke, 644-7870.  
 Female German Shepherd, no papers, 8 wks, free to gd home, 488-6052.

### MISCELLANEOUS

Wilson, J Boros Golf Clubs, 1-3-4-5 Woods, 2 PW irons, 488-1307 or 483-5067, best offr.

Remington tape type adding machines (2) need cleaning, add, subtract, mult., divide, \$20 ea, \$35, Both, 488-1966.  
 Singer sewing machine, straight stitch, in wood cabinet, \$35, Hanksraft cool vapor master vaporizer-humidifier, li nw, \$5, 474-2137.  
 Magicubes, G.E. 3/pack, 6 packs for \$5.00, Handley, 482-7041.  
 Will trade fast, wet, 14' Kona catamaran in xint cndn for slow dry Lido 14, Windmill G.C. 15 etc in similar cndn.  
 Left-hand action savage 110L 7mm Magnum. Four power Leopold scope, \$150, 479-1330, Hoyle.  
 Richest Field Telescope, 8" mirror, (F/4.5), equatorial mount, 50mm, finder scope, 32mm Erfle eyepiece, adapter for 1 1/4 eyepiece, \$200, Boyd, X-4671, 941-7697 or 747-3977.  
 Pool Table, 4 x 8, ball return, Sears Briarwood model, all accessories, li new, \$250, Burt, 333-2117.  
 Simmons yellow baby bed and mattress, \$30, yellow wicker changing table, \$9, swing set, \$20, 488-2775.  
 U.S. Army carbine, .30 cal, wi xtra clips, ammo, etc. NRA gd, \$125.  
 Ham gear: Heath SB610 monitor scope, \$80, Heath SB600 speaker, \$15, Heath HP 23A A.C. power, \$45, Lindsey, 488-0517.  
 Trolling motor, Shakespear 606, xtra long shaft, ideal for runabouts, xint cndn, \$45, Frost 4031 or 474-2129.  
 Baby bed, playpen, stroller, car seat, xint cndn, Arnold, 481-2890 or 483-6321.  
 Custom garden tilling, CLC area, reasonable rates, 488-2652.  
 Would like to trade 9 1/2 books of S&H Green stamps for Big Bonus stamps, 944-2901 or x-5234.

6.50 x 8 ply Armstrong aircraft tires and tubes, 1 new, 1 slightly used, \$30 for pr, 488-3265.  
 Ham radio station, Collins KWM-2, 50' tower, tri-band beam, Rotor, etc, HAM-M, W5/RGA Collins, Jow, 944-6513.

### WANTED

Chain saw, gasoline, gd cndn, reasonable, Zrubek, x-3669, 333-2549 aft 5:30.  
 Nd ride from Pasadena to JSC, 607 Maple off Water/Hairs, x-6106 or 477-8339 aft 6.  
 Back-pack with frame and hip belt, prefer international orange color, Hooper, 488-4120.  
 Cheap fluorescent light fixtures, 481-4196.  
 Dolphin Sr., Sunfish or similar type sailboat and trailer, 334-2180.  
 Pre-1965 dimes, quarters and halves, currently paying \$2.25 per \$1 face value, Lafferty, x-2666 or 485-1997 aft 7.

## Dr. Yoji Kondo To Observe X-Ray Binaries

Dr. Yoji Kondo, Chief of the Astrophysics Section, Planetary and Earth Sciences Division at JSC has been designated as coordinator of a campaign to observe X-ray binaries. The campaign is sponsored by the International Astronomical Union (IAU).

An X-ray binary is believed to consist of a "normal" star and a collapsed star such as a neutron or a "black-hole."

Neutron stars are so dense that a cubic inch of the substance from it would weigh ten billion tons. If a star becomes more massive and denser than a certain critical limit, it cannot support its own weight and is thought to collapse into a mathematical point becoming a "black-hole."

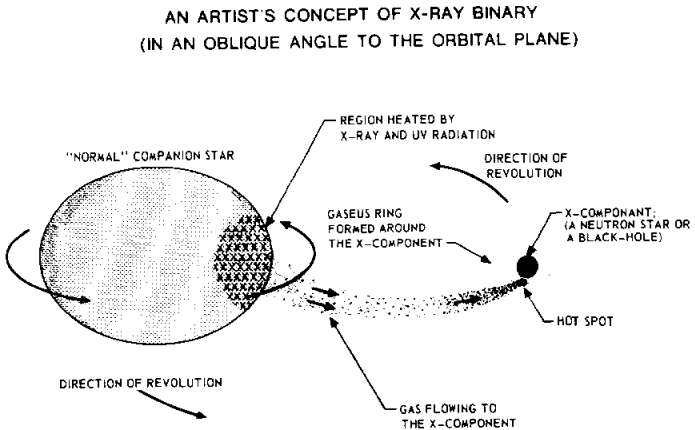
A black-hole possesses no dimensions in its frame of refer-

ence, but could weigh millions of times more than our planet Earth. Its gravitational field is so enormous that not even the light (photons) can escape it. Whatever goes into it will never be seen again, says Dr. Kondo.

NASA Administrator Dr. James C. Fletcher states that there is firm evidence supporting the theory that "such strange phenomena as black-

holes do exist—in our own Milky Way galaxy." The evidence, Fletcher says, was found by British astronomers in data returned from the X-ray telescopes of NASA's Copernicus satellite.

X-ray binaries will provide further opportunities to detect and study black-holes. Investigation of these objects would also provide an opportunity to field-test the theories of relativity.



## ATTENTION

A meeting will be held at Ellington Air Force Base's NCO club at 5:00 p.m., February 20, to discuss establishing a Rod and Gun Club.

If adequate interest is shown, shooting facilities (skeet, trap and rifle range) could be made available at EAFB.

For further information, contact Bill Chandler, X-4771.

# ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER    HOUSTON TEXAS

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 JSC employees.

Editor: Janet Wrather    Photographer: A. "Pat" Patnesky

## Reflections On Skylab

Everything that we have done in the Skylab Program has been necessary for future progress in space and the Skylab experience has confirmed that we are really on the right track in proceeding to develop the Space Shuttle and its Spacelab manned module for use in the 1980s and 1990s.

Skylab, in all its aspects, has demonstrated that this nation is capable of conducting broader and more useful beneficial activities in space that directly relate to our own planet Earth. It has served us well as a true orbiting research facility enabling our astronauts to carry out a wide spectrum of scientific, engineering and biomedical studies.

To appreciate the broad capabilities of Skylab we should take note of President Nixon's landmark speech on space exploration which he made on March 7, 1970. In that speech, the President stated that three purposes should guide our space program: exploration, scientific knowledge and practical application. Skylab and the Skylab men have accomplished simultaneously all of these purposes.

It was also said that we must see our space effort not only as an adventure of today, but also as an investment in tomorrow, and that space activities will be a part of our lives for the rest of time.

Skylab has shown the way. In a very real sense, Skylab can be considered a turning point—for while it was still basically an experimental space station, it nevertheless possessed many qualities and ingredients that will characterize operational missions of the future. It has moved the space program from the realm of the spectacular into a new phase that can be characterized possibly as almost businesslike, if not quite routine.

The investment in Skylab has contributed to an orderly transition from the Apollo era of the 1960's to the Shuttle/Spacelab era of the 1980's and has continued U.S. leadership in manned space flight. We have clearly demonstrated that men can perform valuable services in Earth orbit as observers, scientists, engineers and repairmen.

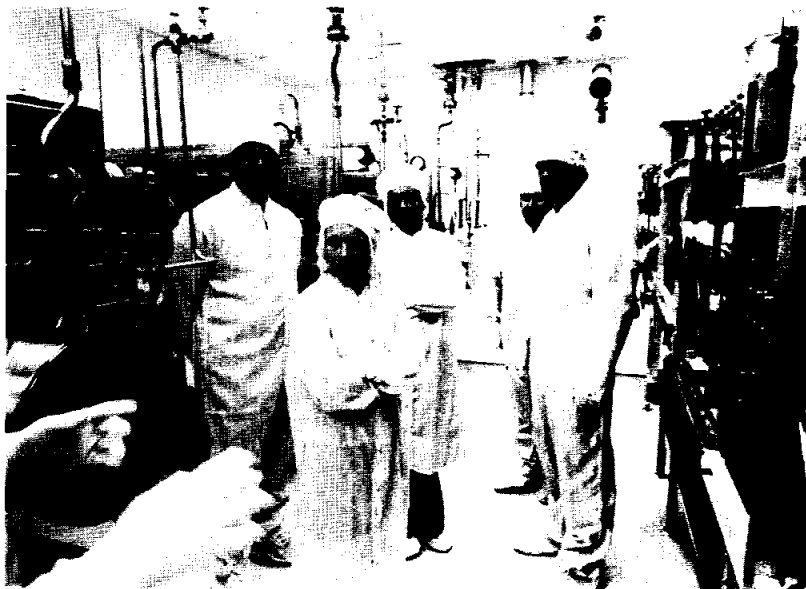
Skylab has given us a wealth of new information about the dynamic processes of the Sun, provided new evidence of the value of Earth Observations from space, helped define the feasibility of making new products in zero gravity, and has stimulated interest in international cooperation in space.

These returns from our Skylab investment already are impressive, but I should point out, the returns are not all in. We will be hearing much more in the months ahead. Indeed, we will be living with our Skylab success for a long, long time.

Dr. James C. Fletcher  
NASA Administrator



OFFICIALS IN MOCR—Pictured above are JSC and NASA Headquarters Officials on the day of Skylab 4 splashdown. The facial expressions of the men spell "success!" Left to right are Dr. James C. Fletcher, NASA Administrator; Dr. George M. Low, NASA Deputy Director; Dale Myers, Associate Administrator for Manned Space Flight; Dr. Maxime Faget, Director of Engineering and Development at JSC; and Dr. Christopher C. Kraft, Jr., JSC Director.



JSC VISITORS—Dr. and Mrs. Richard M. Fairbanks and Dr. and Mrs. Ronald B. Brooks of Washington, D.C. recently visited JSC. They are pictured in the Sample Storage and Preparation/Return Sample Processing Laboratory in Building 31. Dr. Brooks, far left, is Executive Director, Council on Economic Policy at the White House; Dr. Fairbanks is a member of the White House Domestic Council staff. Dr. Michael Duke, JSC Lunar Sample Curator is directly behind Fairbanks.

## Space Symposium To Be Held Soon

The third Space Processing Symposium will be held at the NASA-Marshall Space Flight Center, on April 30 and May 1, 1974.

Early results of all 15 Materials Processing Experiments performed on Skylab will be presented by the principal investigators. These experiments demonstrate and evaluate the merits of molten metal phenomena for manufacturing in a weightless environment.

Other papers will be given covering future flight opportunities and ground-based research studies for space processing.

## Patient Workload Monitor Developed By NASA

Technology derived from the Apollo and Skylab programs has been adapted to produce a new medical device called a Mobile Automatic Metabolic Analyzer (MAMA) which will be used to measure the amount of energy expended by ambulatory patients.

This instrumentation, adapted by Marshall Space Flight Center, provides accurate measurements of metabolic activity of both normal and severely disabled subjects during actual working conditions. It will also be used to gauge the progress of severely disabled persons through the several phases of their rehabilitation training programs.

The unit will be turned over to the Spain Rehabilitation Center, University of Alabama Medical School, Birmingham, for evaluation. Presentation of the unit was made recently at Marshall by Dr. Rocco A. Petrone, Center director, to Dr. John Miller, director of the Spain Rehabilitation Center.

In the past, most metabolic measurement has been limited primarily to oxygen-consumption studies on young, healthy males, either during stationary activity or while walking on the standard treadmill. Studies of the severely

disabled during actual conditioning or retraining programs are quite rare.

MAMA utilizes a metabolic analyzer similar to the one developed for and being used by astronauts in the Skylab program. This and other instrumentation is mounted on a battery-powered cart, designed and fabricated using knowledge gained by Marshall during the development of the Lunar Rover Vehicle used in the Apollo Program.

The motorized cart and instrumentation system will enable rehabilitation doctors and physical therapists to gather accurate workload information. The instrumentation consists primarily of a mass spectrometer which provides a continuous record of the amount of oxygen consumed, the carbon dioxide produced and the nitrogen and moisture exchanged. Additionally, inspiratory and expiratory volumes are recorded, as well as pulse rates and patient speed.

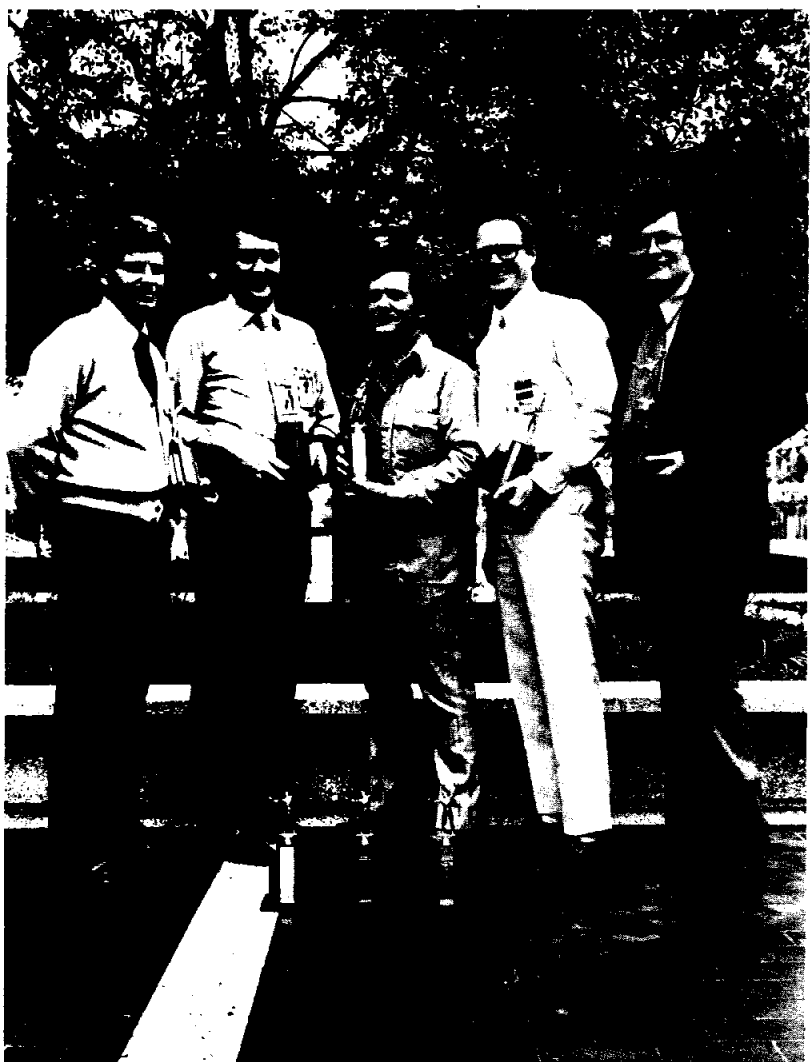
The cart has been designed to follow a predetermined course at a constant speed while the patient walks beside it. An optical tracker is used when the vehicle is in an automatic mode to sense the preset course. This automatic operation frees the doctor to monitor a patient's activity.

Accurate velocity data coupled with accurate physiological data will allow medical personnel to measure the actual stress being imposed on a patient. This will aid the design of assist devices and therapeutic techniques that will minimize the stress on patients.

Most important to MAMA operation is safety. The vehicle will stop when the doctor commands it, when the sensor leaves the track, when the vehicle hits an object, when the patient falters, or when there is an electronic failure.

Studies at the Spain Rehabilitation Center will include both semi-stationary and ambulating activities involving the use of parallel bars, crutches and other walking aids, and lower extremity prostheses or braces. Further studies will include conditions such as cardiovascular disease, cerebral hemorrhage spinal cord injury, neurological diseases and severe pulmonary disease such as emphysema and asthma.

MAMA was designed, developed and manufactured at the Marshall Space Flight Center's Astrionics and Process Engineering Laboratories under the NASA Technology Utilization Program. Juan Pizzaro was the project officer.



FALL VOLLEYBALL CHAMPS—Pictured above are the 1973 fall Volleyball champions, the "Grasshoppers." The team captured the league championship and was undefeated in the double elimination tournament. From left to right are John Waters, Dave Dyer, Tommy Keeton, Lee Norbraten and Larry Hartley. Not pictured are Ham Holt, Porky Jackson and Mutt Shanahan.