

the astrogram

VOLUME XIII
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January 7, 1971

National Aeronautics and Space Administration • Ames Research Center, Moffett Field, California



THE CREATIVE EFFORTS . . . of Ames staff members have been recognized by the NASA Inventions and Contributions Board and resulted in invention awards which were presented recently by Dr. Hans Mark, (far left), Ames Director, to (l to r) Salvadore A. Rositano, Research Instrumentation Branch; Charles C. Kubokawa, Man-Machine Integration Branch; John V. Foster, Director of Development; George E. Cooper, Chief, Flight Operations Branch; James L. Jones, Man-Machine Integration Branch; and Henry A. Cole, Jr., Asst. Chief, Structural Dynamics Branch. Recipients who were not on hand for the ceremony were Robert M. Munoz, Airborne Sciences Office; and Dean M. Chisel, Vehicle Guidance and Control Branch.

Invention Awards to Ames Staff

Invention awards totalling some \$2500 were presented to members of the Ames staff by the Director, Dr. Hans Mark, during a recent ceremony.

The largest award, \$600, was for an invention which relates generally to thruster systems for controlling the attitude of a moving body, and more particularly to a proportional vehicle attitude control apparatus using vortex amplifying devices. Dean M. Chisel of the Vehicle Guidance and Control Branch was the inventor.

Henry A. Cole, Jr., Structural Dynamics Branch, received \$500 for inventing a "Method and Apparatus for Measuring the Damping Characteristics of a Structure." This relates generally to damping measurement devices and more particularly to an automatic on-the-line instrument for measuring the damping characteristics of a structure or system during excitation by random forces or influences.

An invention award of \$400 was presented to Salvadore A. Rositano for "Ultra-Flexible Biomedical

"Electrodes and Wires" which was designed for use by physicians, medical technicians and researchers to connect an electric instrument to the body.

Two inventions designed by Robert M. Munoz, Airborne Science Office, were awarded \$200 and \$100 respectively, for a "Non-Linear Analog-to-Digital Converter" and Communication System with Quadrature Modulation."

The Man-Machine Integration Branch was represented by two members of the staff; Charles C. Kubokawa received \$200 for a fastener apparatus which enables quick engagement, release and fastening operations and is readily manipulated by an operator wearing bulky gloves, such as an astronaut in a space suit; and James L. Jones invented a novel television system which enables selective viewing of a remote object stereoscopically and free of the distortions common in prior art systems.

George E. Cooper, Chief of the Flight Operations Branch, invented

(Continued on Page 2)

Long-Lived Pioneers Make Best Solar Wind Measurements Yet

Scientists are examining a 38-million-mile strip of interplanetary space, located some 62 million miles away from the Earth - as a result of the long lives of two Sun-orbiting Pioneer spacecraft.

The experiment is a means of measuring the solar wind in the space between the Ames-managed Pioneer 6 and Pioneer 8 spacecraft.

Because of some highly-unusual orbit mechanics, the two spacecraft will hold almost fixed positions relative to the Earth from now until next May, so that the experiment can continue until that time. The measurements are being made by experimenters at Stanford University.

"These are probably the most accurate observations ever made of the density of free electrons in the solar wind," comments Stanford's Dr. Thomas Croft.

Solar wind studies are important because the surges of energetic particles sent out by the Sun (the solar wind) appear to influence the Earth's long-term weather cycles. These investigations also produce valuable information on workings of the Sun and for particle physics.

The experiment is possible because the veteran Pioneer 6, which had a planned life of six months, now has been operating for almost five years, and still is returning a variety of useful data.

The orbit of Pioneer 6 around

the Sun is inside that of the Earth. Hence, the spacecraft travels slightly faster than the Earth, getting farther ahead each year.

Pioneer 6 now has almost circled the Sun relative to the Earth and is back near the Earth, close enough for performance of the two-spacecraft experiment.

The experiment works as follows:

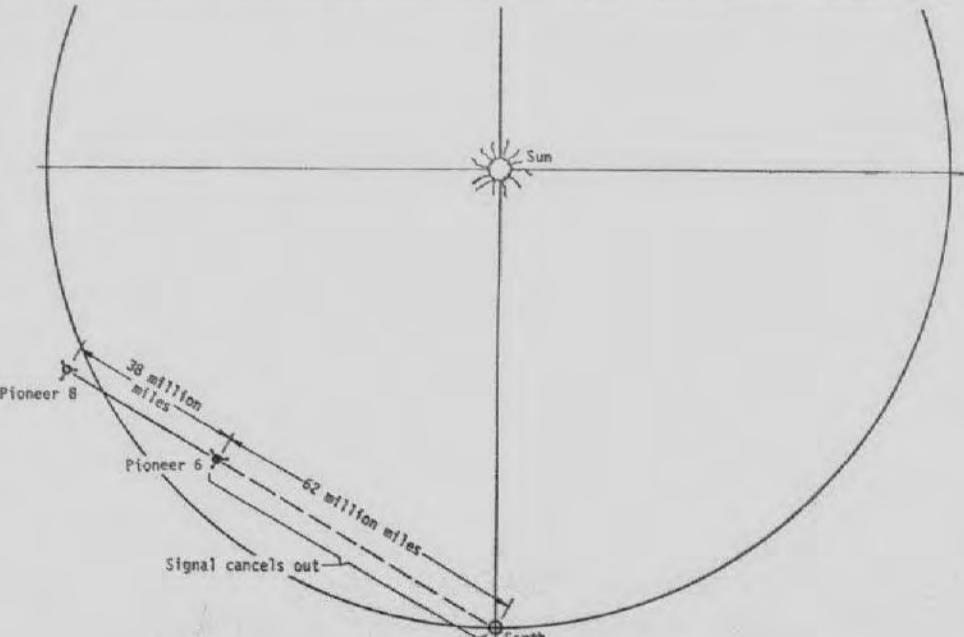
Stanford experimenters measure the solar wind by determining the way radio signals between Stanford's 150 foot antenna on Earth and the Pioneers are slowed by interplanetary electrons.

Pioneers 8 and 6 and the Earth will be lined up, or in close to perfect alignment, until the end of May, 1971. They occupy a single line about 100 million miles long. Pioneer 8 is about 100 million miles away and Pioneer 6 is 62 million miles away.

Experimenters obtain precise solar wind measurements between the two spacecraft by subtracting the Earth-to-Pioneer-6 measurement from the longer Earth-to-Pioneer-8 measurement. This means that effects on the two sets of radio signals traveling an identical path between the Earth and Pioneer 6 cancel out. Remaining effects are caused entirely by solar wind phenomena in the 38 million miles between Pioneers 6 and 8.

It is important to perform the experiment in this way because when the Stanford experiment nor-

(Continued on Page 3)



REMINDER**Tests for Summer Jobs**

This is a reminder that time is running out to make application for testing for competitive summer jobs in Federal agencies for the summer of 1971. Those applying by Jan. 8 will be tested Feb. 13; and those applying by Feb. 3 will be tested March 13. Applications postmarked after Feb. 3 will not be accepted. Call Ames ext. 2021 for application forms.

INVENTION AWARDS

(Continued from Page 1)

an aircraft throttle reference control which enables a pilot to return a throttle lever to a reference position quickly and without visual attention or control. The award was \$200.

A magnetic position detection method and apparatus designed by John V. Foster, Director of Development, was awarded \$100. The invention relates particularly to a technique for accurately establishing the position of an aircraft relative to a landing strip and/or a predetermined glide path and instantaneously providing responsive communicative data.

Sonic Boom Research Conference

The Third NASA Contractors-Centers Conference on Sonic Boom Research was held recently in Washington, D.C. Objectives of the conference were to review the current status of the NASA University Program and to survey the current research programs at the NASA Centers.

The meeting attracted 150 representatives from universities, industry, and the government covering both civilian and military research. Avenues of research discussed were those that appear most promising for prediction of sonic boom generation and propagation and for reduction of sonic boom overpressure.

During the two-day conference some 28 technical papers were presented, including eight papers authored by Ames research scientists. At the session on "Prediction of Sonic Boom Generation and Propagation-Theory and Experiment" papers were titled: "Numerical Solution for the Complete Shock Wave Structure Behind Supersonic-Edged Delta Wings" by Harvard Lomax and Paul Kulter, Computational Fluid Dynamics Branch;

"A Numerical Investigation of Sonic Boom at Threshold Mach Numbers" by Thomas Coakley, Hypersonic Aerodynamics Branch; "Uniform Approximations for Shocks Generated by Thin Rectangular Wings" by M.S. Friedman of Columbia University and Sanford S. Davis, Vehicle Aerodynamics Branch; "A Preliminary Investigation of Sonic Boom Waveforms Near Focusing Ray Systems" and "A Near-and Far-Field Analysis of the Sonic Boom Emitted by Nonlifting Rectangular Wings" both by Sanford Davis; and "Extrapolation of Wind Tunnel Sonic Boom Signatures Without Use of a Whitham F-Function" by Charles L. Thomas, Vehicle Aerodynamics Branch.

In another session on "Configuration for Minimization of Sonic Boom" Ames papers presented by researchers in the Vehicle Aerodynamics Branch, were "A Preliminary Report on Shock Coalescence" by Raymond M. Hicks and Charles L. Thomas; and "On the Extrapolation of Measured Near-Field Pressure Signatures on Unconventional Configurations" by Joel P. Mendoza and Raymond M. Hicks.

Beside the Ames papers, two additional papers were presented by company representatives covering research performed at Ames.

In a final session of the meeting Harvard Lomax chaired a seven-man panel discussion that focused attention on an assessment of the overall status of sonic boom research.

Fuel Supplies May Be Limited

President Nixon's special assistant for Consumer Affairs recently issued a statement that fuel supplies throughout the country are expected to be limited this winter.

There are indications, too, that with the continued fuel shortage, Federal price restrictions may be eased, resulting in a cost increase to the consumer. Faced with this possibility, every effort to cut down on fuel consumption should be explored. Two purposes will be served: first, economically by holding down household expenses; secondly, it will assure an adequate fuel supply for all.

In issuing the fuel report several recommendations were offered which Ames employees should consider. They are:

- Lower thermostat at night to at least 68 degrees. Keep it lowered if you are away from home for 24 hours or more.

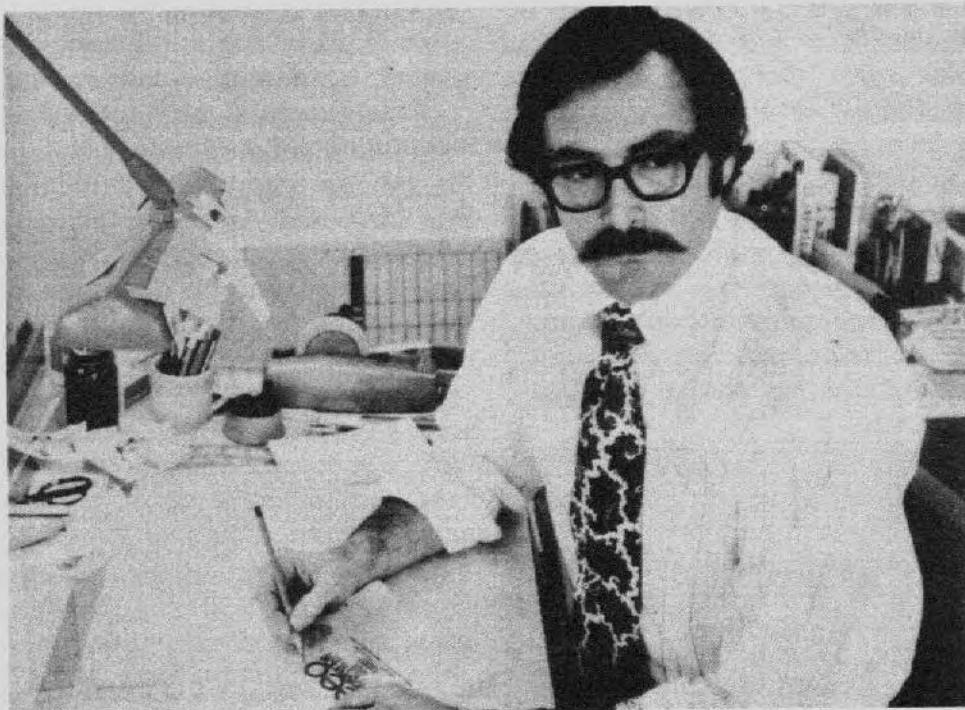
- Check furnace to make sure it is operating properly; change filter when necessary.

- Where practical, insulate exterior walls and ceilings. If drafts of cold air are evident, seal tightly.

- When the fireplace is not in use make sure damper is closed.

- Turn off all lights when not needed. If possible use major appliances before 8 a.m. and after 6 p.m.

- Repair leaking hot water faucets. A leak of one drop per second adds up to 700 gallons per year.



KENNETH R. ATCHLEY . . . Visual Information Specialist in Design at Ames was given Special Recognition for his work as layout artist for the "Campus Courier," a monthly newsletter serving Federal college associations in several Western states. The salute was published on the cover of the "Courier" and reads; "As the layout artist for the "Campus Courier, Ken has produced what we consider to be a highly attractive and handsome format for our publication. Based on reports from college and agency friends, our readers heartily concur. Congratulations and best wishes, Ken."

Ken did the complete graphics design work for the publication, including original symbols to accompany the various column titles, original lettering and choice of the print style. This work will remain as a permanent feature of the newsletter.

Ken's work may be recognized as the excellent graphics designs done for such Ames publications as the cover for "Adventures in Research," the history of Ames; the pamphlet for the Student Space Biology Research Program; and the programs for all the Ames conferences.

Library Move

The Ames Main Library will be moving in the next few weeks from the second floor of Building 202 to the recently renovated first floor and basement. This will be the first phase of the expansion of library facilities recommended a little over a year ago by the Library Committee appointed by the Director. All library operations will be phased down during that time, but it is hoped that a minimal service will be provided while the move is in progress.

Date of the initial move is not known due to uncertainties in construction schedules and installation of new equipment. However, the first phase of the move is expected to be completed before the end of January.

Specific dates of the move will be announced when plans are finalized.

AIAA Meeting

The San Francisco and Mt. Diablo Sections of the AIAA will hold a joint meeting on January 14 at Ames Research Center. The program includes a tour of the 40-by-80-Foot Wind Tunnel from 5:30 to 6:30 p.m.; social hour, 6 to 7 p.m.; 7 to 8 p.m.; and a presentation of the Apollo 13 accident by Dr. Hans Mark, Ames Director, 8 to 9 p.m.

Reservations must be made with Val Watson, ext. 2696, by January 11. Guests are invited.

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Editor Dot Evans Reporters NASA Employees	
Deadline for contributions: Thursday between publication dates	

Astronaut Buddy System on Moon

Sharing a tank of compressed air on the way back to the surface is a standard emergency procedure among Scuba divers, with the mouthpiece passed back and forth between the two divers who share the air remaining in a good air tank. It's called, logically, the "buddy system."

Now the buddy system approach has been adapted to Moonwalks through the use of connecting lines that could feed cooling water from an astronaut's backpack life support system to the space suit worn by his companion. The connections would give the men enough time to return to their Moon landing craft if the water cooling system of one of the backpacks failed.

Called the Buddy Secondary Life Support System (BSLSS), the life-sustaining pair of flexible hoses will be provided for the first time in Apollo 14, the third United States manned lunar landing mission, scheduled for launch by NASA, Jan. 31.

The connecting hoses will be used in the second and longest of the two Moonwalks of the mission. They will be carried, readily accessible in an emergency, on the two-wheeled cart that the astronauts will pull across the lunar surface to transport their tools and rock samples.

The buddy secondary life support system by sharing the water supply between two crewmen, stretches the time the emergency oxygen will last from about 40 minutes to 1 to 1 1/4 hours.



HOME FOR THE HOLIDAYS . . . Pvt. Kenneth J. Edwards (center), U.S. Army, a former enrollee in the Neighborhood Youth Corps Program at Ames, visited the Center during his Christmas leave and took time to fan the IBM cards to see what's in his future. Computer operations training which he received under the direction of Toby Gonzales (left), Assistant Chief of the Computer Operations Branch, and Computer Operator, Miss Reba Rippy (right), prepared him for specialized training in the Army. He has completed basic training and after finishing a 12-week clerical course at Ft. Ord he will be assigned to Ft. Jackson, South Carolina, to attend Computer Programming School for six months to a year. As he talked about his future Pvt. Edwards was quick to give full credit for his new career to both Toby and Reba and expressed his gratitude for all their help.

PIONEER 6 and 8 (Continued from Page 1)

mally is done using just one spacecraft, rapidly-varying effects of the Earth's turbulent ionosphere must be subtracted.

Ionosphere effects are measured by Stanford using the ATS satellites, stationary over the Earth at 22,300 miles. However, these are rough measurements because of the continuous changes in the ionosphere.

The current measurements, on the other hand, are extremely precise because the simultaneous ionosphere measurements are identical for both spacecraft. And when Pioneer 6 data is subtracted from that for Pioneer 8, ionosphere effects are eliminated entirely.

Pioneer 6 is currently 5.6 million miles inside the Earth's orbit and about 42 degrees behind the Earth. Pioneer 8 is 2.5 million miles outside the Earth's orbit and about 66 degrees behind the Earth.

The two spacecraft will remain aligned with the Earth for six months because Pioneer 8 is at perihelion and Pioneer 6 is at aphelion. This means that both Pioneers are nearly matching the Earth's orbital speed around the Sun.

Pioneer 6 will return to its solar orbit injection point in Aug., 1971. At its farthest distance away on the other side of the Sun, the spacecraft was 182 million miles from the Earth.

Ski Trips Offered

As the ski season begins to show promise of being one of the best Californians have seen in a long time, the Ski Club is getting underway with some exciting trips. Below is a schedule of places, and dates for the trips. For details contact the person listed with the trips. You need not be a member of the club to join us.

February 12-15, Squaw Valley, Annual Washington Birthday trip, Bob Stroub, ext. 2442.

March 5-7, Incline Village/Alpine Meadows, bus trip, staying at State-line, North Shore. Jack Tunnell, ext. 2683.

March 27-28, Mount Rose, 9,700 feet good late season skiing. Ralph Maines, ext. 2151.

Entertainment Offered to Ames Employees at Discount

Membership cards, mail order discount coupons, and other special offers are available without charge to Ames employees, retirees, tenant organizations, and contractors. Contact "The Astrogram" Office, Room 134, Administration Management Building.

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NEW ITEMS:

DINNER CLUB: The Carriage Trade Dinner Club of San Francisco and the Peninsula is offering Ames employees a \$2 discount on a \$10 membership. Application forms are available.

* * * * *

SPORTS AND BOAT SHOW:

NASA-Ames Day at the San Francisco Sports and Boat Show is Thursday, Jan. 14. Reduced rate coupons valued at \$1 are now available.

* * * * *

DISNEYLAND: The 1971 Magic Kingdom Club cards for special benefits at Disneyland have arrived and are available for distribution. There are no membership fees or dues connected with the Magic Kingdom Club. To join, just pick up a free membership card.

JOGGERNEWS

... by Jim Woodruff

Now you can read about the Joggernauts in the San Francisco papers as well as "The Astrogram." At least they were mentioned -- "dazzled by the space age Joggernauts from NASA" -- in an article on the Double Dipsea Race in the January 3 "California Living Magazine," a supplement of the San Francisco Chronicle-Examiner.

A gun shot at midnight started the new year, three Joggernauts,

and about 150 other runners in the Town Crier New Year's Eve Midnight Run (10,000 meters) at Foothill College. The Joggernauts were Jerry Barrack, Jim Woodruff, and Dora Willoughby. Jerry finished in about 42 minutes; the others took a little longer. All three found an amiable crowd and excellent weather, and recommend the Midnight Run as a good way to get the new year off to a running start.

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My check for _____ is enclosed.

Name _____

Address _____

City _____ State _____ Zip _____

Please enclose remittance and a stamped self-addressed envelope. All ticket requests must reach theatre seven days prior to show date, and tickets will be mailed soon after.

NOTE DEADLINE DATE FOR SUBMISSION OF COUPON

Ames Airings

... by Jeanne Richardson

There were some long faces the first day back after New Years. Only the staunch Stanford fans were still smiling and giving the victory sign. There was a bit of friendly bickering in the Personnel Division. It seems BILL WILLIAMS, Chief of the Division, and JOHN LEVEEN, Training Officer, sat on opposite sides of the Rose Bowl. Bill, a new comer to our state, spent his first California New Years cheering on his native-state team, Ohio. John, a graduate of Stanford, sat across the Stadium cheering the Indians on to victory. Although Bill claims the game should be appealed due to their 'illegal' player, Plunkitt, he says it was a well-played, clean game. John agrees, and adds that the best team won. JACK BOYD, Dep. Dir. of Aero. and Flt. Mech., and BILL MEAD, Ofc. of the Director were also present and cheering at the Rose Bowl.

If the people of Ames weren't watching football games, it seems they were in the Sierra skiing. VIRGINIA SANFORD, Procurement, went to Mount Rose for a week, with a brand new pair of Hart skis and came back with a brand new snow-white cast. Virginia was enthusiastic her first day (natch) on the slopes and took a tumble that broke her left foot. She's not letting a little ole broken bone keep her down, though. She's planning another ski trip in seven weeks, as soon as the cast comes off.

JERRY SMITH (Systems Analysis Branch) and his wife Gracia and their daughter Jill flew to Wisconsin the last week of 1970 for the wedding of his son Gary in Madison on December 28. The ceremony was constructed by the bride and groom, both graduate students at Berkeley. The trip included a Christmas visit with Jerry's brother in Whitewater.

CONGRATULATIONS

C. SKIP YEM, Research Facilities Engineering, and his wife Dorothy, added to their family Dec. 26. Corbin Scott, third boy and fourth child of the Yem clan, was born at 11:45 and weighed in at 6 1/2 lbs., 20 inches.

History of Ames

A limited number of a paperback edition of the "History of Ames" by Edwin P. Hartman has been obtained and will be offered for sale to Ames and contractor employees at the Center. Price of the edition is \$4 and may be purchased from "The Astrogram" Office, Room 134, Admin. Mgt. Bldg.



CONGRATULATIONS . . . were in order recently when Ernesto O. Directo (left), Animal Caretaker, was presented with a citation and a cash award for an adopted suggestion. His idea was the fabrication of a portable tub for use in bathing dogs in the Life Sciences animal facility. His improved method has simplified the bath procedure, is more efficient, and has resulted in tangible first-year savings to the Center, which earned him a cash award of \$75. Mr. Directo is pictured as he read the citation with Roy A. Gatewood (right) Supervisor of the animal facilities, Office of the Director of Life Sciences.

GOLF

... by Kay Bruck

The annual Ames Golf Club Award Dinner and Installation of 1971 officers took place this year at the Bold Knight in Sunnyvale. Master-of-Ceremonies, Clark White, made it a memorable occasion by passing out Arnold Palmer Trophies (he called them "Arnie's") for the duffers who had "The Best Improved Form", "The Best Dressed Golfer Image", "The Highest Gross Score," and other important classifications (to duffers, that is).

Movies of this year's Riverside Tournament were shown, as well as a rerun of former movies taken over the years, to the accompaniment of many mirthful remarks.

The 1971 officers of the Ames Golf Club were introduced by outgoing President Frank Prior. Don Dust, President; Spencer Shaw, Vice-President; Clark White, Treasurer; Frank Lazzeroni, Handicap Chairman; and Kay Bruck, Secretary. Members of the golf club presented to retiring Treasurer, Mitch Radovich, a beautiful golf bag by way of saying, "Thank You, Mitch, for long and faithful service, above and beyond the call of duty." Mitch has handled the club finances for many years, cheerfully giving of his time, energy, and knowledge to keep the club solvent.

FPC Scholarship

The Federal Personnel Council of Northern California has announced the establishment of the tenth annual college level scholarship fund. As in the past the scholarships are for children of Federal employees and has been extended to a youth employed under the Youth Opportunity Programs (the President's Stay-in-School Campaign and

WANT ADS

The Astrogram's ad section is provided as a personal, non-commercial service to Ames employees. Advertiser must be identified by name, extension and organization. The name may be left out of the ad but is needed for records. Ads must be submitted in writing to The Astrogram, N-241-4, by Thursday, a week before publication. The advertiser's home telephone number must be provided as a point of contact except in carpool notices.

AUTOMOBILES

For Sale-1958 MGA - \$250. Good Body, wire wheels new tires and new brakes, needs engine work, call 369-8847, after 6 p.m.

For Sale- 6 1/2' camper shell. Safety windows, insulation. \$75. Call Jim Lamb at 241-1168 or 657-8643.

For Sale-1959 Ford, 2-door, Sedan, R & H. Good transportation car \$125. R.D. McCann, 379-1178.

HOUSING

For Rent-2-bedroom apt. w/w carpet, drapes, AEK Available in mid-January, near Downtown Palo Alto, adults, no pets. 325-6945.

MISCELLANEOUS

For Sale-Oval 12x12 braided rug. Full violin. Multiplex adapter. Call 327-3606.

Wanted-8 mm projector in good condition. J. Smith 867-9260.

For Sale-U.S. Kylon Latex foam extra long twin mattress and box springs, and bed extenders. \$50 New blue twin fitted covers and 3 Dolsters with covers, \$45. Call 248-0638.

For Sale-Man's ski sweater, size, large. Never used, hand made. Call Barbara German at 246-2929.

For Sale-1968 Honda 90, 8-speed, 950 miles, \$195. Don Lefforge at 293-4010.

For Sale-1957 Cadillac \$185, call Don Lefforge at 293-4010.

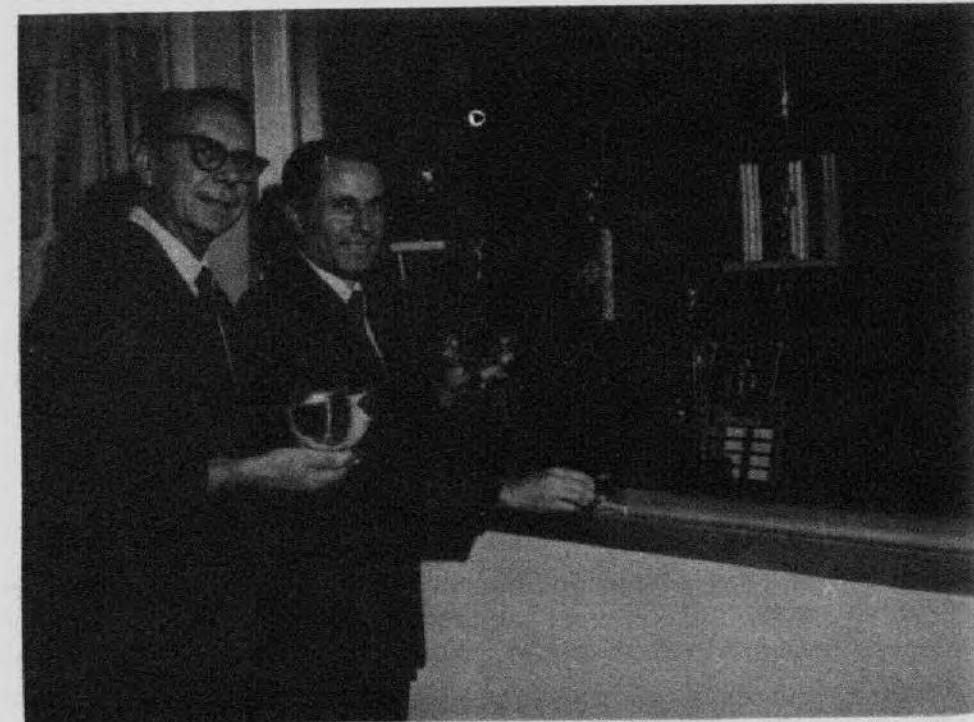
For Sale-Baby high chair, good condition, \$150 phone 245-6411.

For Sale-Mag Rims, Ford 14" x 7", \$125 or best offer, phone 246-8987, after 7:30 p.m.

For Sale-Vibes, \$225; Classical guitar, \$100, call 941-4419.

the Summer Youth Opportunity Campaign.)

Deadline for making application for the scholarship is April 1. Application forms may be obtained by contacting Mrs. Evans or Miss Richardson, Room 134, Admin. Mgt. Bldg. ext. 2385.



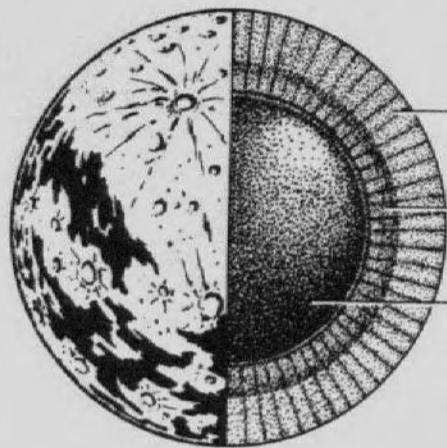
THE AMES GOLF CLUB PRESENTS . . . the 1970 winner of the Director's Cup, Dick Johns (left) and the winner of the Championship Title, Al Petretti (right), who are anxious to display their trophies in the Ames trophy case located in the Cafeteria.

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VOLUME XIII
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National Aeronautics and Space Administration • Ames Research Center, Moffett Field, California

LUNAR STRUCTURE



UPPER MANTLE
150 MILES THICK
LOWER MANTLE
60 MILES THICK
CORE
1700 MILES DIAMETER

Ames Magnetometer Measurements Reveal 200-Mile Moon Crust

Results obtained from the Ames Magnetometer placed on the lunar surface by the Apollo 12 astronauts, coupled with measurements made with the earlier Ames magnetometer on the Explorer 35 Moon-orbiting satellite, have revealed some highly important information about the Moon's interior and its structure.

The first measurements of the interior of the Moon indicate that the Earth's neighbor has a basalt-like mantle 210 miles deep, which apparently surrounds a cool core of primordial olivine-like rock.

This conclusion was announced last week by Dr. Charles Sonett, Principal Investigator, at the Apollo Lunar Science Conference in Houston.

The measurements suggest that the Moon's outer layer was melted during the first billion years of its 4.5 billion-year history. This was attributed to the heat of accretion, heat generated when the primordial dust cloud which preceded the solar system rushed together under the force of gravity to form the planets including the Moon, probably in less than 5000 years. To this heat of formation probably was added the heat of decay of radioactive elements. They say that a basalt-like outer layer for the Moon is a virtual certainty. Some other interpretations of their data, as it bears on lunar heating mechanisms, are possible but unlikely.

MOON'S CENTER

The Ames scientists comment that their measurements have extended to the center of the Moon.

The present analysis has gone down to 570 miles below the surface. This means they have analyzed seven-eighths of the Moon's physical volume, including a substantial portion of the core.

MAGNETIC FIELD

Basically, the scientists determine electrical conductivity of the Moon by using the magnetic field of the million-mile-an-hour solar wind as the field passes through the Moon.

From this conductivity measurement, temperature can be deduced if the composition of the Moon is known.

Only one temperature profile appears consistent with the conductivity measurements, and with data on known lunar and Earth rocks, and the known mass of the Moon.

SCIENTIFIC TEAM

"The Moon model we have derived is the only sensible one," says Dr. Sonett. Members of his scientific team are Drs. David Colburn, Palmer Dyal and Curtis W. Parkin of Ames; Drs. Gerald Schubert and Bruce Smith, UCLA; and Dr. Kenneth Schwartz, America Nucleonics Corporation.

"To measure the lunar interior, we first found that the Moon's outer layer is extraordinarily reactive to the magnetic fields of the solar wind," says Dr. Sonett. "This means it has a very high electrical conductivity. Furthermore, this conductivity is almost identical to

(Continued on Page 3)

Highlights of Ames Accomplishments

The scientific research and technical efforts at Ames Research Center continued to progress during 1970. Some of the highlights are reviewed here.



STOL RESEARCH AIRCRAFT

* The development of a jet powered, augmented wing STOL research aircraft is presently underway. The program, which is an extension of a long term cooperative effort by NASA and the Canadian Government has advanced to the point where a research aircraft is warranted. A contract was placed with the Boeing Company for the modification of the Ames C-8A de Havilland Buffalo to provide such an aircraft. The aircraft will be used to prove in flight the validity of the augmentor wing concept and to study STOL avionics systems.

* A portable lunar surface magnetometer was designed and developed by Ames researchers for the forthcoming Apollo 14 mission. The entire package was a complete in-house effort and involved a wide range of support from many organizations at the Center.

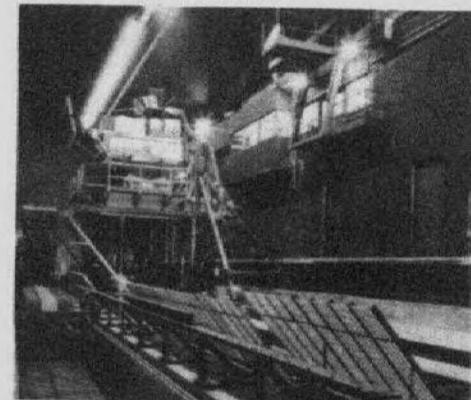
* The Ames gas exchange experiment (GEX) has been selected as one of the four biology experiments slated for the Mars-Viking mission in 1975. Dr. Harold P. Klein, Director of Life Sciences, is heading a team responsible for the total package of biological experiments to be flown on the mission.

* Tests completed of a 1/4-scale model of an Ames-designed version of a supersonic transport (SST) inlet system have shown promising results. The inlet system offers improved performances with lower structural weights and simplified mechanical design compared to the prototype SST inlet system.

* Space Shuttle Vehicle (SSV) research has included studies of the flow over models which has led

to suggested solutions or areas where further emphasis and study are required; a study to define a system concept and operational procedures required to automatically land the SSV; and a program to evaluate candidate refractory metals for the SSV.

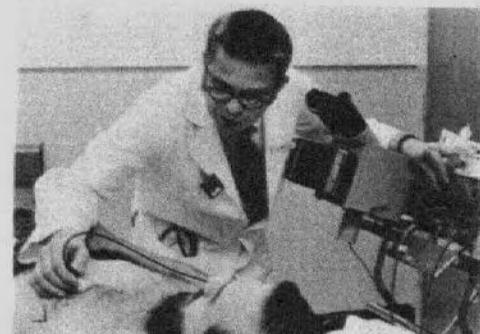
* Results of the analyses of the Murchison Meteorite conducted at the Center have shown for the first time that numerous organic compounds are present which resulted from extraterrestrial, abiotic chemical processes.



FLIGHT SIMULATOR

* During the past year the Flight Simulator for Advanced Aircraft (FSAA) was validated as a simulator for the Concorde, the British/French Supersonic Transport. A cooperative effort with the FAA has been directed toward the establishment of certification criteria.

* German cells designed for the HELIOS (High Intensity Solar Cell Development) near-sun mission have been tested at Ames with a high intensity solar simulator.



BRAIN SENSOR

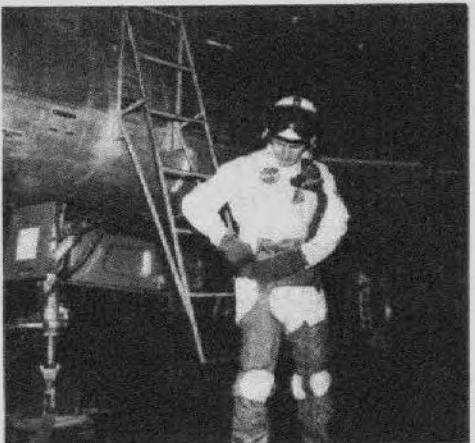
* A brain sensor and radio transmitter system, developed for space medical research with test pilots, is being used effectively in the diagnosis and treatment of schizophrenic mental patients. Scientists at Ames and Agnews State Hospital for the mentally ill, are working together on the project.

(Continued on Page 2)

Ames Accomplishments

• DAP-1, one of the body's enzymes, has been discovered to be a practical new tool for determining the structure of the body's vital proteins.

• The Orbiting Frog Otolith (OFO) experiment developed and tested at Ames was launched to study the electrical responses of the otolith sensors during hours of weightlessness and controlled acceleration. Flight results are now under study.



PRESSURE SUIT

• A pressure suit worn by pilots to avoid blacking out during high-speed maneuvers was used on a patient at Stanford Hospital to arrest internal bleeding which could not be controlled by established procedures. Ames researchers modified the G-suit in less than four hours and after being fitted to the patient abdominal bleeding was arrested in 10 hours.

• Embrittlement of metals - Research at Ames has resulted in an improved understanding of the causes and mechanisms of hydrogen embrittlement of metals so that the design of spacecraft and aircraft components can properly take these effects into account and avoid structural failures from this source, which are more possible than previously thought.

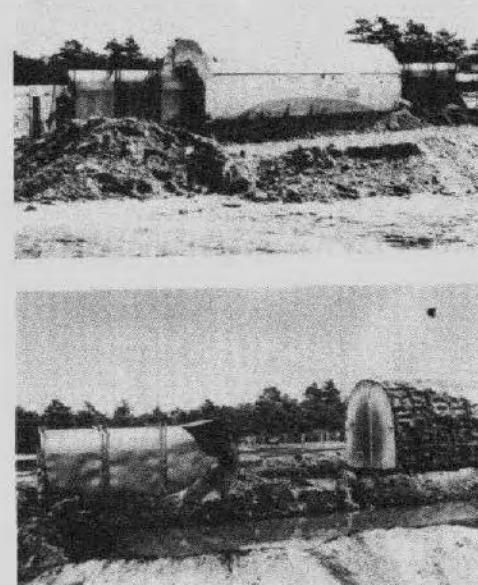


SONAR

• Scientists from the Stanford School of Medicine and Ames successfully tested a new application of sonar (often called ultrasound) that can provide fundamentals of the heartbeat and circulation heretofore unobtainable without passing a catheter into one of the heart chambers.

Continued from Page 1

• Pioneer 6, which at launch in December 1965 had a planned life of six months, completed its fifth year in solar orbit and continues to provide essential new data for scientific research. The contract phase of Pioneer F and G Spacecraft has been completed with TRW, Inc.



FIRE PROTECTION SYSTEM

• A new concept for a primary fire-protection system for large passenger aircraft was demonstrated by Ames scientists. The tested system used fire-retardant paints and foams developed by scientists. The paint is a new product based on salts of nitro-substituted aromatic amines. The foam is a polyisocyanurate with additives, and is believed to be one of the most effective fire retardant foams yet devised.

• Special Assignments: Ames Director, Dr. Hans Mark, was asked to serve on the committee which was convened to investigate the Apollo 13 accident.

• Mr. C.A. Syvertson, Ames Deputy Director, is on temporary assignment with the Department of Transportation in Washington, D.C. as Executive Director of the Civil Aviation Research and Development Policy Study. He will return to the Center at the completion of the study.

• Ames participated in Project Tektite, a long duration, underwater habitability study carried out by many government agencies in the Virgin Islands; the Ames Convair 990 and crew participated in the Barbados Oceanographic and Meteorological Experiment (BOMEX)

• The IBM 360-67 has become operational as the prime computation facility at the Center.

• In the area of cost reduction NASA Headquarters assigned the Center a goal of \$2,250,000, which was exceeded by \$335,320.

AIAA Aerospace Sciences Meeting

Eleven Ames scientists will participate in the American Institute of Aeronautics and Astronautics' (AIAA) ninth Aerospace Sciences Meeting in New York, Jan. 25-27.

Scientists representing all areas of the United States, England, Russia Canada and Yugoslavia will take part in the meeting. The sessions and papers presented will cover a full spectrum of Aerospace topics. Non-aerospace areas will also be covered, including environmental pollution and physiological fluid mechanics. The general topic of "The Evolving Aerospace Climate - Government, Industry, University Interrelationship" will be discussed on the second day of the meeting.

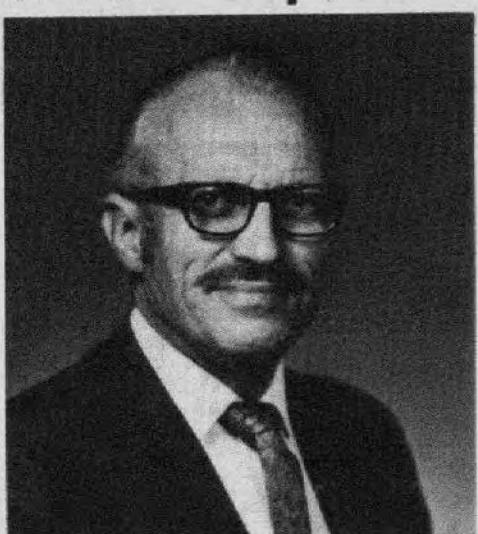
Ames' Victor L. Peterson, Hypersonic Aerodynamics, will act as Chairman of the Atmospheric Flight Mechanics 2: Entry Vehicles and Missiles session. Vernon J. Rossow, Theoretical Branch, will act as Chairman of the Fluid Dynamics 1: Non-Aerospace Applications session.

Howard Goldstein, Thermal Protection Branch, will present his paper, "An Analytical Model for Hypersonic Ablation of Thorium Dispersed Nickel Chrome Alloy." Paul Kutler and Harvard Lomax of the Theoretical Branch will present their paper, "A Systematic Development of the Supersonic Flowfields over and behind Wings and Wing-Body Configurations Using a Slock-Capturing Finite-Difference Approach." Joseph H. Kemp, Jr., Hypersonic Aerodynamics, and F.K. Owen, Fluid Mechanics Branch, will present their paper "Nozzle Wall Boundary Layers Mach Numbers 20 to 47. A paper entitled "Local Turbulent Skin Friction and Boundary-Layer Profiles Measured on Nonadiabatic Flat Plates at Hypersonic Mach Numbers" will be presented January 27, by Edward J. Hopkins and Earl R. Keener of the Vehicle Aerodynamics Branch. Also Federico Casal and Samuel W. Pitts of Propulsion Systems will present their paper, "Size and Cost Factors Influencing the Attractiveness of Nuclear Electric Propulsion."

Theatre Offer

SONG OF NORWAY: There is still time to take advantage of the Ames group sales mail order for the Century 21 showing of the Song of Norway. Ames night will be Jan. 31 at 8 p.m. Tickets cost \$2.40, the order must be placed before Jan. 24.

Cooper Honored as Nation's Top Pilot



George E. Cooper, Chief of the Ames Flight Operations Branch, has been selected by the Flight Safety Foundation to receive its Richard Hansford Burroughs Award as the nation's outstanding test pilot.

The award was presented to Mr. Cooper for his pioneering work in exploring "the unknown envelope of flight at both the high and low speed ends" for NASA.

The award honors a test pilot killed at New Haven, Conn., in 1946 when he elected to stay with his disabled experimental plane rather than abandon it over an inhabited area.

Mr. Cooper received the trophy at a luncheon in New York City on Wednesday, January 13.

Credit Union

The thirteenth annual meeting of the Moffett Field Employees' Credit Union will be held on Friday, January 29, at 7:30 p.m.

The meeting will be held at the Bold Knight, 19930 Stevens Creek Blvd., Cupertino. This will be a dinner meeting with steak as the main course. Cost of the dinner is \$4 per person. Tickets may be purchased at the credit union office or from any credit union representative.

The agenda includes election of credit union officers and reports of credit union progress during the year. It is most important for all members to attend.

Credit union assets have almost reached the \$3 million mark.

The Astrogram	Room 134 Admin. Mgt. Building Phone 2385
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Editor Dot Evans Reporters NASA Employees	
Deadline for contributions: Thursday between publication dates	

Magnetometer

Continued from Page 1

that of the basalts found on the lunar surface."

"The electrical conductivity of the Moon rises very sharply down to about 150 miles below the surface, and then falls again very rapidly to minimum level at 210 miles down. It again begins to rise strongly as depth increases further. Computer analysis of the data is in progress to extend determination of the Moon's conductivity profile, all the way to the center of the Moon, from the present depth of 570 miles below the surface.

"If the abrupt changes in conductivity were all due to temperature, the temperature profile from the lunar surface downward would show drastic shifts, including a 400 degree C negative shift in just 60 miles. This is impossible for a planetary body as old as the Moon, because in billions of years by the laws of physics, temperature profiles would have to have smoothed out," Dr. Sonett adds.

The scientists had to find a temperature profile, going into the Moon, consistent with the sudden peaking, sudden very sharp drop, and then strong rise of electrical conductivity from the surface inward.

The scientists also used the Ames magnetometer data to measure the rate at which the Moon is radiating heat. This is a rate about one eighth that at which the Earth radiates heat. If the Earth were reduced to a Moon-like size, the Moon would be radiating heat half as fast as the Earth.

The magnetometer projects at Ames have been implemented by the Special Projects Office under the direction of Donald R. Mulholland. The Explorer 35 magnetometer launched in 1967 was manufactured by the Honeywell Corporation, and the complex Lunar Surface Magnetometer (LSM) was fabricated by Philco-Ford in Palo Alto. Manager for the LSM on Apollo 12 was Herbert V. Cross.

Additional LSM instruments have been developed and are scheduled to be carried on Apollo 15 and 16 to obtain further data at other lunar sites. John S. Keeler is the Experiments Manager for these missions.

The development effort to produce successful LSM instruments began at Philco in early 1966. It has been very extensive and involved a substantial number of people. Here at Ames an even greater effort has been put forth by the staffs of organizations who

NASA Business Cards Available Through Services and Supply

NASA business cards for Ames employees are available through the Ames Services and Supply Division.

The cards are of two-ply bristol stock with the NASA insignia in blue and red. Copy is dull black with any desired imprint. Cost of the cards is \$6.65 for •250; this includes sales tax, postage, and cardette case.

Call Vicki Deiwert, Ext. 2714 for order form. Delivery is approximately three weeks after receipt of order.

ARA Board Elected

The Ames Recreation Association election results have been tallied. Congratulations to winners, and new ARA Executive Board members; Andy Bogart, Materials Research; Jessie C. Gaspar, Programming; Roger C. Hedlund, Electronics Research; Jan Konrath, Data Management Analysis; Peggy Larson, Materials Research; Armando Lopez, Full-Scale and Systems Research; Al Puccinelli, Simulator Systems Operation; Jeanette Remington, Board of Examiners; Emerson Shaw, Photographic Branch.

In the event of a resignation, three alternates to the Board members were elected. The alternates are Loretta Vice, Technical Information and Dr. Seymour Stein, Medical Office. There was a tie for third alternate position, between Bruce Ganzler, Simulation Experiments and Jeanne Richardson, Employee-Management Relations.

The ARA would like to extend special appreciation to the seven girls who spent long hours tallying the votes. Many thanks go to; Barbara Allen, Computer Operations; Jeanne Clemson, Communications; Winnie Malloy, Communications; Kathleen Huffman, Problem Definition and Analysis; Shirley Casey, Accounting; Jackie Wright, Accounting; Patricia McFarland, Programming Methods Inc.

have supported the project for the past four years. Not only do the scientific investigators and the project managers at the Center deserve credit for their efforts which have contributed to the recently recognized success of the LSM, but many other personnel at Ames as well. The list includes Thomas R. Pochari and Robert E. Munoz, Space Sciences; John C. Arvesen, Thermal Protection; David F. Engelbert, Research Equipment Engineering; George E. De Young, Reliability and Quality Assurance; and many employees in the Computation Division.



WILLIAM J. HURLEY . . . (left) and Madeline Bolbol (right) of the NASA Inspections Division, are pictured above with a copy of the NASA Achievement Award they received recently. The award was made in recognition of the "high standards" and excellence" achieved by the Division.

NASA Achievement Award to Ames Office

Mr. William J. Hurley and Mrs. Madeline Bolbol of the NASA Inspections Division recently received letters of commendation and a copy of the NASA Group Achievement Award. The award was presented to the NASA Headquarters Inspection Division by Mr. Richard C. McCurdy, Associate Administrator for Organization and Management.

The award reads, "In recognition of the effectiveness of the personnel of the Inspections Division in achieving high standards of operations and professional excellence in conducting the functions of the Inspections Division. They have played a significant role in strengthening the resources and manpower of NASA during an important period in the history of the space program."

The Inspections Division is charged with determining conditions which may lead to violations of laws or regulations by NASA employees, contractors or others which may affect NASA, with conducting impartial inquiries into allegations of such irregularities, and with educational programs relating to conflict of interest and other ethical matters concerning NASA Standards of Conduct.

Entertainment Offered to Ames Employees at Discount

Membership cards, mail order discount coupons, and other special offers are available without charge to Ames employees, retirees, tenant organizations, and contractors. Contact "The Astrogram" Office, Room 134, Administration Management Building.

NEW ITEMS:

DINNER CLUB: The Carriage Trade Dinner Club of San Francisco and the Peninsula is offering Ames employees a \$2 discount on a \$10 membership. Application forms are available.

SEA WORLD: The 1971 Dolphin Club cards are now available. The card is a new feature this year, and entitles the member and his family to a 15% discount at the Sea World main gate (San Diego).

BEACHCOMBERS CLUB: The new 1971 Beachcomber Club card is now available. The card entitles the club member and his family to a \$3 discount on the Beachcomber ticketbook. The Boardwalk will be open weekends during the winter.

DISNEYLAND: The 1971 Magic Kingdom Club cards for special benefits at Disneyland have arrived and are available for distribution.

FRONTIER VILLAGE: The new, 1971 Frontier Wonderland Club cards are available. The card entitles the member and his family to admission and any ten rides for \$2.75. This is a savings of \$4.25 over regular prices.

ALL ABOARD CLUB:

Due to some procedural changes in the All Aboard! Club program, membership cards dated 1970 will continue to be honored through April 2, 1971. The cards are honored at both Roaring Camp and the Holiday Inn of Santa Cruz. Regular fares at Roaring Camp are now \$3/\$1.50 and, with the All Aboard! Club card the fares are \$2.70/\$1.35.

Ames Airings

... by Jeanne Richardson

It seems I upset a few of Ames' ardent football fans. I promise, never again, to spell Plunkett with an "i!"

MARSHALL BIGGS (RFE) and his wife Vera decided to do something different for their twenty-eighth wedding anniversary. So, they caught a plane to Paris, and did the town. It was the Biggs' first visit to Europe, but they certainly weren't the typical tourists.

For instance, how many tourists buy a condominium on the Costa del Sol in Spain? The Biggs' thought it would be a nice place to spend some time after retiring. Marshall said the climate was similar to Southern California (minus the smog) and the food was fantastic. Not to mention a beautiful view of the Mediterranean, and the best of Flamenco music and dancing.

Since North Africa is so close to their new apartment, the Biggs' made a trip to Tangiers, Ceuta and Tetouan.

They liked the camels and the belly dancers in Africa best. Mrs. Biggs, according to Marshall, fell in love with one of the camels because of its "beautiful long eyelashes." Mr. Biggs didn't find the animals quite so attractive. He said they looked like horses, made by a committee.

CONGRATULATIONS:

Christmas day was a busy time for a few Ames people. ED ROGERS (HFF) was at Good Samaritan Hospital becoming a daddy. His wife, Linda presented him with a 7lb. 7oz. son at 11:56 p.m. Scott Edward evened things out for the Rogers; they already had a daughter.

JOAN BAUER (Reproduction) became Mrs. Gregory Tobias, Christmas day, in the Holy Spirit Church of Fairfield. It was a simple ceremony, with a Christmas dinner reception following.

ALFRED KASS (Simulation Experiments) and his wife Marlene don't believe in doing things the slow way. They decided they wanted a family, so they got busy and had twins. The identical boys, Ian Andrew and Evan Gary, were born January 12 at Kaiser Hospital. Ian and Evan have another brother, and a sister, too.

Center Taxi Service

The hours of operation for the Center's taxi service has been extended. This service is now available from 7:30 a.m. through 5 p.m., Monday through Friday.



1971 AMES GOLF CLUB OFFICERS . . . (left to right)

Don Dust, President; Spencer Shaw, Vice-President; Clark White, Treasurer; Frank Lazzaroni, Handicap Chairman; and Kay Bruck, Secretary.

GOLF

... by Kay Bruck

The Ames Golf Club schedule for 1971 has been completed and reads as follows:

Feb. 6, Skywest; March 6, Springhills; April 3, Santa Teresa (tentative date); May 22, Sunol (Cypress); June 5, Pajaro; July 17, Aptos; Aug. 14, Sunol (Palm); Sept. 11, De Laveaga; Oct. 2, Riverside; Nov. 6, Laguna Seca.

All Ames personnel and contractor personnel assigned to Ames, who are interested in becoming members of the Ames Golf Club may do so by contacting Clark White Treasurer, ext. 3132, MS 210-9. Initiation Fee is \$2 and the annual dues are \$4.

Since the first game of the season is less than a month away, Ames Golf Club members are requested to pay their membership dues promptly. A flyer is being distributed regarding the first game of the year.

Holidays, 1971

When Public Law 90-363, the so-called Monday Holiday law, became effective on January 1, 1971, Federal Holidays will be observed as follows:

New Year's Day, Jan. 1, Washington's Birthday, Third Monday in February. Memorial Day, Last Monday in May. Independence Day, July 4. Labor Day, First Monday in September. Columbus Day (new), Second Monday in October. Veterans Day, Fourth Monday in October. Thanksgiving Day, Fourth Thursday in November. Christmas Day, December 25.

BOWLING

... by Dennis Riddle

We have finished the first half! The final standings are:

Division I	Won
1st Comets	42
2nd Huffers	41
3rd Keggers	40
4th 10 Pins	38
5th Rikkety Wrecks	37
6th The Sportsmen	36
7th Road Runners	34
8th Primo Warriors	30

Division II	Won
1st Eight Balls	37
2nd The Lopers	28
3rd Crazy Eights	28
4th Alley Katz	25
5th Pin Bangers	25
6th Bullshooters	24
7th Gotchas	23
8th Sterling Engrs	22

Congratulations to the two first place teams, the Comets (Dale Frankel, Otto Meckler, Joe Marvin, Francis Genovia, and Jim Park), and the Eight Balls (Dennis Riddle, Nancy Riddle, Jack Ratcliff, Bob Merrick, and Jerry Dickson). In the 1st division, it was quite a battle, with first place changing hands the last night.

Some of those bowlers who really exceeded their averages were; Norm McFadden 200/550, Joe Marvin 224/583, Howard Garrison 214/551, Dave Lozier 220/544, and Otto Meckler 221.

Two of the women were in the ole pocket also: Dot Olson 220 (127 average), and Rosemarie Fasano 203 (139 average).

The night of January 19 started the second half of our season. Best wishes to all the teams.

WANT ADS

The Astrogram's ad section is provided as a personal, non-commercial service to Ames employees. Advertiser must be identified by name, extension and organization. The name may be left out of the ad but is needed for records. Ads must be submitted in writing to The Astrogram, N-241-4, by Thursday, a week before publication. The advertiser's home telephone number must be provided as a point of contact except in carpool notices.

AUTOMOBILES
For Sale - 1957 Chevy. 4-dr., radio/heater, good condition, inside and out. Clean, runs well, must sell, make offer. 941-1861.

For Sale - 1969 Pontiac Bonneville Station Wagon. PS, PB, AT, AC, ski rack and chains, new tires and BK's. \$3400, call evenings at 736-0916.

HOUSING
For Rent - Winterized cottage near Rte. 89 and N. Tahoe areas. Sleeps 6 - \$50/wk or \$40/wknd call 328-4842.

MISCELLANEOUS
For Sale - 1970 Honda 350CL 600 miles, still on warranty. Beautiful condition. Will consider no offer less than \$700. Call Jim at 257-3885 or after 11 p.m. call 968-3140.

Wanted - Fifth ride group member, 7:30 - 4:00 shift, from Los Altos area, bounded by El Camino El Monte Foothill Expressway and San Antonio Road, C.D. Kolbe, xt. 2066.

For Sale - Siamese kittens. Registered, pedigreed blood lines. Chocolate point, male only \$20, call 253-4475.

For Sale - Man's Ski Sweater, pullover, green, size large. Barbara German at 246-2929.

For Sale - Boy's Stingray bicycle equipped with generator light and sissy-bar. Excellent condition, call 274-5703 after 5 p.m.

For Sale - Complete Concorde stereo tape deck, system with reverse-track, \$350. Revina Scriber - Polisher \$15, call 867-1139.

Warning to Tax Consultants

Each year about this time, the question arises whether a Federal employee may act as a tax consultant to private clients without a conflict of interest.

The General Counsel of NASA has stated in this connection: "... Although an employee may set himself up as a tax consultant without violating the conflict of interest statutes, he is, as a practical matter, limited to collecting information and giving advice. As soon as he signs a return, which he must do if he prepares it, he creates the possibility that he may be called to discuss with the Internal Revenue Service, and thereby to violate the law."

A careful reading of Title 18 United States Code Section 205, set forth on page 52 of Standards of Conduct for NASA Employees (NHB 1900.1A, October 1967) is recommended.

"Thank You" Note

"TO ALL AMES EMPLOYEES: My mother and I wish to express our deep appreciation for your thoughtfulness during the recent loss of our loved one. It is gratifying to know that other heart patients may be helped by your generosity in donating to the Heart Fund in my father's name. Thank you all, Margaret Lundell, Library Branch"