Approximately 500 scientists and students attended the XIIIth Lunar and Planetary Science Conference held in Houston, March 15-19, under the joint sponsorship of the American Geophysical Union, the Lunar and Planetary Institute, and the NASA Johnson Space Center.
Special sessions were held during the Conference on Monday evening, "Report to the Planetology Community... Solar System Exploration", and on Wednesday afternoon, "New Opportunities for Earth and Planetary Research in the Mid-1980's". Thursday morning, during the "Planetary Interiors and Venus" session, a presentation was made by V. L. Barsukov, Director of the Vernadsky Institute of Geochemistry and Analytical Chemistry, on the results of the Venera 13 and 14 missions. The presentations included photographs taken by both Venera 13 and 14 as well as United States-produced radar maps of the Venus surface used in selecting the landing sites for both missions. (See V-Gram, p. 2, included with this BULLETIN for story on the Venera findings.)

The Second annual LPSC Chili Cook-Off, held on March 16 on the grounds of LPI, was the social highlight of the conference. The cook-off was attended by over 260 conference participants and their guests. Sixteen chili teams competed in the contest, a barbeque dinner was served and guests enjoyed live music provided during the evening.

Winners of the chili cook-off were:

First prize: Martin-Marietta "Up the Creek Gang"

Second prize: NASA/JSC Lockheed "Fox Fire"

Third prize: JPL "Pacific Plate"

SPACEWEEK '82: SPACE—OUR CONTINUING JOURNEY

Spaceweek is a week-long celebration that occurs yearly in late July, July 20 being the anniversaries of both the Apollo 11 moon landing and the Viking 1 Mars landing. It is an effort to promote public support across the country for the exploration and utilization of space. Spaceweek National Headquarters, located in Houston, is coordinating activities to be held throughout the week of July 16-24, 1982 in many U.S. cities.

The major goal of Spaceweek is to demonstrate widespread public support for a vigorous program of space activities. This will be accomplished in the following ways:

1. Inform the public about space by holding events during which the benefits of space technology and the results of space science are explained in laymen's terms.
2. Enlist the participation of both scientists and engineers by having them explain discoveries and technological developments during the public events.
3. Encourage the involvement of all individuals and societies that promote space in the organization and successful completion of Spaceweek activities. The entire Spaceweek effort is brought about by volunteers from such groups. This combination into a single national coalition will provide the strength and unity necessary to emphasize the enthusiasm and commitment this country feels towards space exploration.
4. Provide visibility through extensive media coverage.

During Spaceweek, free public events will include scientific and technological exhibits, movies, lectures, model rocket meets, telescope "star parties", space art, and other events with popular appeal. These events form the basis for a vigorous media campaign of news releases, newspaper and broadcast interviews, and live coverage.

Spaceweek '82 can thus be influential in showing our nation's leaders the depth of popular support for space. Spaceweek is a time each year to commemorate our past accomplishments in space and commit our nation to further steps toward our next frontier.

Volunteer help is needed for Spaceweek. Individuals and groups wishing to become involved can contact Fred Becker, Publicity Manager, at 713-483-2566, or write to Spaceweek National Headquarters, P.O. Box 58491, Houston, Tx. 77258.

NEW CONTRACT CONTINUES SUPPORT FOR PIONEER EXPLORATION PROGRAMS

A nearly two-million dollar contract for continuing support of NASA's several interplanetary Pioneer spacecraft was awarded today by NASA-Ames Research Center to the Bendix Field Engineering Corporation's Advanced Data Systems in Sunnyvale. The contract is
in support of the NASA solar system exploration program. The contract is a cost-plus-award-fee for a two-year period of performance commencing April 1, 1982. Option clauses provide for an additional three years, or a total potential life of five years. The initial funding authorized is $500,000, with the estimated cost of the two-year period totaling $1,852,958.00.

The contract will provide for operation of the seven Pioneer spacecraft: the Pioneer 6-9, Pioneer-Venus Orbiter, and Pioneers 10 and 11.

Pioneers 10 and 11 surveyed Jupiter and Saturn, and both are on their way out of the solar system. Pioneer 10 is mankind's first spacecraft to leave the solar system. The Pioneer-Venus Orbiter, one of two U. S. spacecraft operating at a planet, is making photos of Venus and measurements of its atmosphere, space environment, and interior composition. Pioneers 6 through 9 have been circling the Sun as solar weather stations and returning information for researchers.

The terms of the contract provide for Mission Flight Operations and Data Processing Support Services, which include flight operational control of the seven Pioneer spacecraft, and operation, maintenance, and upgrading of the Pioneer Mission flight operation and data processing facilities at NASA's Ames Research Center at Mountain View, California.

The work will be performed on-site at Ames. Now doing the work, Bendix was the only respondent to the competitive request-for-proposal. Patrick Baulay is the Bendix Manager, and Richard O. Fimmel is the Pioneer Missions Manager. The parent company of the local Bendix office is Bendix Field Engineering Corporation of Columbia, Maryland.

NASA PR 82-12

PIioneer 10 Completes Ten Years in Space, Nears Edge of Solar System

Pioneer 10, the first spacecraft to Jupiter, now making man's first trip out of the solar system, completed ten years in space on Tuesday, March 2, 1982.

Since launch in 1972, the far-traveling U.S. spacecraft has traversed the asteroid belt, survived Jupiter's punishing radiation belts, and operated almost without flaw. Pioneer 10 has traveled 3.27 billion miles, received over 40,000 commands from Earth, and transmitted more than 125 billion bits of scientific data.

With one exception, Pioneer continues to function well, and is currently engaged in a new enterprise, defining the extent and behavior of the Sun's atmosphere, the magnetic bubble which contains the Sun and the planets. This "bubble" in the interstellar medium is called the heliosphere.

Pioneer 10 now is more than half way between the orbits of Uranus and Neptune, 2.5 billion miles from the Sun. About a year from now in April 1983, Pioneer will be farther from the Sun than the planet Pluto. By June 1983, it will be farther out than Neptune—outside all of the planets of the solar system, in their current positions.

Pluto's orbit is so elongated that the "outermost planet" will be inside Neptune's orbit for the next 17 years. NASA officials have, therefore, selected October 1986 (when Pioneer crosses the mean orbit of Pluto) as the official date for the first spacecraft's leaving the solar system. Pioneer will cross the farthest extension of Pluto's orbit in April 1969.

At Pioneer's current distance of 2.5 billion miles, it takes three hours and 42 minutes for spacecraft data, traveling at the speed of light, to reach the Pioneer Operations Center at NASA's Ames Research Center,
Mountain View, CA. This one-way communication time currently is increasing at a rate of one minute every four days.

Despite damage from intense Jovian radiation, and hits by tiny micrometeoroids, plus ten years of continuous operation, almost all systems are preforming well. Pioneer’s magnetometer ceased to function in 1975, but experimenters can calculate the interplanetary field from charged particle trajectories, magnetic data already gathered, and several correlations from five other Pioneer scientific instruments.

Scientists await current spacecraft findings “with intense excitement,” says Dr. James A. Van Allen, University of Iowa, Pioneer 10 experimenter, “Because we think the Sun is typical of a majority of the stars in the universe. It’s the only star we can measure from ‘close up’. Finding the extent and exact mechanisms of the Sun’s atmosphere will tell us a great deal about the Sun itself, about the interstellar gas surrounding the solar system, and hence about stars in general.”

The picture now emerging seems to show that the heliosphere is enormous, far larger than predicted. The heliosphere (created by the million-mile-an-hour solar wind, blowing out from the sun in all directions) appears to be a tear-shaped magnetic bubble. The bubble is “streamlined” by the motion of the solar system through the interstellar gas.

Pioneer is traveling “down the tail” of the heliosphere tear drop. The spacecraft is seeking the “skin” of this heliospheric bubble, the boundary between the Sun’s atmosphere and true interstellar space. No one knows, but scientists think this boundary region may lie between five and ten billion miles from the Sun. Experts at NASA’s Deep Space Network expect to be able to track Pioneer out to somewhere beyond five billion miles.

At the long-lived spacecraft’s current distance, the Earth would be seen as a pin point of light, never more than 2.2 degrees away from a Sun still intensely bright, but no larger than a pin head. Because of this huge distance, and the decline in brightness of the Sun, Pioneer’s sun sensor will not be able much longer to provide the sun pulse, which gives rotational position of the spinning spacecraft several times a minute. However, NASA-Ames mission controllers have devised, and will soon be using, a method of making star maps with the Pioneer camera (Imaging Photopolarimeter) to provide the needed rotational and attitude data.

Pioneer 10 has an array of achievements and discoveries. Some are:

1. First trip to Jupiter.

2. First crossing of the Asteroid Belt and finding that it presents little hazard to spacecraft.

3. Discovery that Jupiter is a liquid planet.

4. First model of Jupiter’s huge, pulsating, magnetosphere and tremendously powerful radiation belts.

5. First accurate measurements of mass and densities of Jupiter’s planet-sized moons, key to the planet’s formation history.

6. First closeup pictures of Jupiter’s Great Red Spot and belts and zones showing details of atmosphere circulation.

Recent Pioneer discoveries about the space at the edge of the solar system raise other new questions. We now believe the heliosphere bubble "breathes" in and out once every 11-year solar cycle, says Dr. John Simpson, University of Chicago, Pioneer experimenter. The shock waves of the enormous storms on the Sun seem to persist in the heliosphere for as long as a year, probably changing the heliosphere bubble's shape, as if it were a huge pulsating jelly fish.

"It's hard to overstate the interest of the physics coming out of this phase of the Pioneer mission," comments Dr. Aaron Barnes, NASA-Ames astrophysicist. "We are constantly entering unexplored territory, and we really don't know what we'll learn about our local star."

Other recent findings about the heliosphere:

1. The solar wind was expected to slow with distance from the Sun, but this has not happened. Almost no motion energy has been lost as heat.

2. The primary source of turbulence in the outer heliosphere is storms on the Sun, not solar wind collisions.

3. Near solar maximum, cosmic ray particles incoming from the galaxy in all velocity ranges (even near light speed) become half as numerous or are shut out completely from the heliosphere.

4. For unexplained reasons, high velocity streams of electrons from Jupiter moving through the heliosphere don't wobble as expected from the planet's axial tilt.

5. The heliosphere is bisected by a 'flapping' current sheet, aligned with the Sun's equator, and believed to extend to the interstellar boundary.

6. As solar storm activity builds up, the heliosphere is believed to deform into a more oval shape lined up with the Sun's equator, from its rounder shape at solar minimum. It also may expand in size.

GODDARD DIRECTOR LEAVES NASA FOR PRIVATE INDUSTRY

A. Thomas Young, Director of Goddard Space Flight Center, Greenbelt, Md., left NASA on March 20, 1982. He has been named vice president of research and engineering for Martin Marietta Aerospace, Bethesda, Md., effective March 22.

Young joined NASA's Langley Research Center in Hampton, Va., in 1961, working on Project Vector, an aerospace controls research project of the Lunar Orbiter Project. In 1968, he was assigned responsibility for the development of Mars mission objectives for the Advanced Space Projects Office. He was the Viking Science Integration Manager prior to his appointment as Viking Mission Operations Manager in early 1974 and was named Viking Mission Director in 1975. From November 1976 to February 1979, he served as Director of the Planetary Program in NASA's Office of Space Science. On Feb. 1, 1979, he was appointed Deputy Director of Ames Research Center, Mountain View, Calif., and in February 1980, was named Director of Goddard.

Young was a Sloan Fellow at the Massachusetts Institute of Technology in 1971-72, and received a master of management degree. He was presented the Distinguished Service Medal, NASA's highest award, in 1977. He received two Presidential ranks, that of Meritorious Executive in 1980 and Distinguished Executive in 1981. He is a Fellow of the American Institute of Aeronautics and Astronautics and a Fellow in the American Astronautical Society.

HINNERS NAMED GODDARD DIRECTOR

Dr. Noel W. Hinners, Director of the National Air and Space Museum, has been appointed Director of NASA's Goddard Space Flight Center, Greenbelt, MD, effective June 14.

Hinners became Director of the National Air and Space Museum in April 1979. Prior to that he was Associate Administrator for Space Science at NASA Headquarters from June 1974 to April 1979 and he served as Director of Lunar Programs in the Office of Space Science. He joined NASA in 1972 as Deputy Director and Chief Scientist, Apollo Lunar Exploration.
Before joining NASA, Hinners was associated with Bellcom, Inc., as a member of the technical staff, supervisor of the lunar science group and head of the lunar science exploration department.

Hinners served as chairman of NASA's Lunar Dust Erosion Study Committee in 1969-70, and the Apollo Photo Data Users Group in 1971. He was also chairman of the Apollo Site Committees for Apollo 12-17 missions. He currently chairs NASA's Solar System Exploration Committee.

He is a member of Phi Beta Kappa and Sigma Xi honorary societies, the American Geophysical Union, the American Association for the Advancement of Science, the National Academy of Sciences' Space Science Board and a trustee of the University Corporation for Atmospheric Research.

**NASA PR 82-49**

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**KRAFT LEAVING JSC**

Dr. Christopher C. Kraft, Jr., who built Mission Control and left his imprint on every American manned space flight has announced that he will step down as director of the Johnson Space Center at the end of the year.

Kraft, 58, said he plans to leave NASA shortly after the space shuttle Columbia makes its first operational flight, scheduled for November, but has no definite plans.

"This will be a transition period for activity at the Johnson Space Center and a reasonable time to depart," Kraft said in a statement released by NASA.

Kraft is the last member still working at NASA from the Space Task Group, a team of 35 engineers selected in 1958 to start America's man-in-space program. Members of the group, including Kraft, helped establish the Manned Spacecraft Center in Houston in 1961. The center became the control hub for all U.S. manned spaceflights starting with Gemini 4 in 1964. The center later was named the Lyndon B. Johnson Space Center, honoring the late president.

Kraft's career in space began in 1945 as a member of the National Advisory Council on Aeronautics, the forerunner to NASA. In the early phases of the Mercury program, he was a principal contributor to many of the basic flight control techniques used in manned space missions, serving as a flight director for all the Mercury missions and many of the Gemini flights. He directed the design and implementation of Mission Control and then supervised the training of a new group of flight directors, many of whom now hold top management jobs in NASA. In 1972, Kraft was named director of the Johnson Space Center.

Kraft was honored by President Carter in 1980 as one of the nation's outstanding government employees. Three times, he has received NASA's highest award, the Distinguished Service Medal.

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**GRiffin NAMED NEXT DIRECTOR OF JSC**

Gerald D. Griffin, a former Apollo flight director, will be the next director of the Johnson Space Center. Griffin, 47, will replace Christopher C. Kraft, Jr.

Griffin, a native of Athens, Texas, was graduated from Texas A&M University with an aeronautical engineering degree. He is now vice president of Scott Science and Technology Inc., of Scottsdale Arizona, a consulting firm owned by former astronaut David Scott.

Griffin, who joined the space agency in 1964, was a flight director for all 11 manned Apollo missions. He was the lead flight director for Apollos 12, 15 and 17. He was a flight controller during the Gemini program.

When he left JSC, Griffin became assistant administrator for legislative affairs at NASA headquarters. While in Washington he also served as deputy associate administrator for space flight operations. Griffin also served as deputy director of the Kennedy Space Center, Florida, and the Dryden Flight Research Center at Edwards Air Force Base, California.

Griffin, who worked for Kraft as a flight director, said, "I've never been placed in a situation where I will be following a living legend. That gives me cause to ponder."

He said, "Chris has always been one of my heroes and always will be. He was always highly motivated and a leader of the highest quality. He had the capability to instill those qualities in those who worked with him."
LEWIS DIRECTOR TO LEAVE NASA TO RETURN TO MIT

Dr. John F. McCarthy Jr., director of Lewis Research Center in Cleveland, will leave NASA July 1 to return to the Massachusetts Institute of Technology, Cambridge, as professor of aeronautics and astronautics.

Before joining Lewis in October 1978, McCarthy was director of MIT’s Center for Space Research and professor of aeronautics and astronautics. From 1962 to 1971, he was with North American Rockwell Corp., where he served as vice president, Systems Engineering of the Los Angeles Div. Other positions at North American Rockwell included: vice president, research and engineering and executive vice president-technical at the Los Angeles Div.; vice president, research and engineering, North American Aviation Div. Office; vice president of research, engineering and test for the Space Div.; assistant chief engineer, Apollo; and directorships in control systems, technology and space sciences at the Space Division.

A native of Boston, McCarthy attended MIT where he received his bachelor’s and master’s degrees in aeronautical engineering in 1950 and 1951. After graduation, he joined the staff of MIT’s Aeroelastic and Structures Research Laboratory and was responsible for the design and operation of one of the first variable Mach number supersonic test sections, in which he performed some of the earliest successful supersonic flutter tests. In 1962 he received his doctorate in aeronautics and physics from the California Institute of Technology.

McCarthy is the author of numerous technical papers; a Fellow and former Director of the American Institute of Aeronautics and Astronautics (AIAA); a Fellow of the American Astronautical Society; an Associate Fellow of the Royal Aeronautical Society; a member of Sigma Gamma Tau, Sigma Xi, the Research Society of America, and the National Academy of Engineering.

In 1973 he was awarded the Meritorious Civilian Service Award (Air Force) for his work on the C-5A transport airplane and in 1978 he received the Decoration for Exceptional Civilian Service for distinguished service as a member of the Air Force Scientific Advisory Board.

STOFAN TO HEAD LEWIS RESEARCH CENTER

Andrew J. Stofan, of Oakton, Va., has been named Director of the Lewis Research Center in Cleveland, Ohio, succeeding Dr. John F. McCarthy, Jr. Stofan’s appointment was announced by James M. Beggs, NASA Administrator. The Lewis Research Center is a major element of the space agency.

Stofan was Acting Associate Administrator for Space Science at NASA headquarters in Washington, DC, from October 1980 until February 1982 when Dr. Burton I. Edelson became Associate Administrator of the new Office of Space Science and Applications. For the past month, Stofan has been serving as advisor to Edelson in structuring the new office.

Stofan will assume his new duties July 1, when McCarthy returns to MIT as Professor of Aeronautics and Astronautics.

Stofan began his professional career at the Lewis Research Center in 1958 as a research engineer. In 1962, he was assigned to the original Centaur Project Office as a member of the Propellant Systems Section, becoming head of that Section in 1966. A year later, he was named Project Manager of the B/1-B/2 test programs. In 1969, he was named Assistant Project Manager, improved Centaur, and a year later became Project Manager of the new Titan/Centaur vehicle project office, where he was responsible for all activities associated with the design and development of the launch vehicle. He also directed the launch of the Titan/Centaur Proof Flight in February, 1974. Stofan assumed the role of Director, Launch Vehicles, in 1974 and from then until 1978, directed the launch of ten Atlas/Centaurs (Intelsat, COMSTAR and HEAD spacecraft) and six Titan/Centaurs (Viking, Helios and Voyager spacecraft). In January 1978, Stofan was appointed Deputy Associate Administrator for the NASA headquarters Office of Space Science. In October 1980, he became Acting Associate Administrator.

He received group achievement awards for the Titan/Centaur project team and the Helios team in 1975, and for the Shuttle Flight certification team in 1981. He also received the NASA Exceptional Service Medal in 1975 and the NASA Distinguished Service Medal in 1981.
LPI TOPICAL CONFERENCE ON CHONDRULES AND THEIR ORIGINS

The Lunar and Planetary Institute is sponsoring a Topical Conference on "Chondrules and Their Origins," to be held at the LPI in Houston, Texas, November 15-18, 1982. This conference is intended to attract informed scientists from a wide variety of backgrounds to participate in provocative discussions in an informal atmosphere. Among topics to be discussed are the textures and mineral chemistries of chondrules, the major, minor and trace element chemistries; isotopic measurements and chronology; and theoretical and experimental studies of chondrule formation. To receive additional conference information, contact Pam Jones, Conference Administrator, LPI, 3303 NASA Road One, Houston TX 77058 (713/486-2150), or Elbert King, Chairman, Organizing Committee, Dept. of Geosciences, University of Houston, Houston TX 77004. (713-749-3724)

LPI/NASA TOPICAL CONFERENCE ON PLANETARY VOLATILES

The Lunar and Planetary Institute and the National Aeronautics and Space Administration will co-sponsor a topical conference on "Planetary Volatiles", October 9-12, 1982, in Alexandria, Minnesota. Conveners of the conference are Richard O'Connell and Robert O. Pepin. Sessions planned include:

1. Initial and present volatile inventories in the Earth, other planets, meteorites and comets
2. Observational evidence on the time history of volatile transfer among reservoirs
3. Volatiles in planetary bodies, their mechanisms of transport, and their relation to thermal, chemical, geological and biological evolution

Principal focus will be on Earth, Mars and Venus for comparative discussion of volatiles in planetary systems, and on meteorites and comets for estimates of the initial complement of volatiles in preplanetary matter. Expressions of interest and potential participation are invited from all relevant areas of research. Those interested in participating should send a brief description of their proposed contribution to the meeting, indicating whether they wish to speak (5 minutes, 15 minutes, or 25 minutes) or submit materials for a poster session, whether they intend to submit an abstract, and the general area of their scientific interest. Deadline for receipt of applications is June 15, 1982. Further information may be obtained by writing: Planetary Volatiles Conference, Lunar and Planetary Institute, 3303 NASA Road One, Houston TX 77058 or by telephoning 713/486-2150.

DIVISION FOR PLANETARY SCIENCES, AAS, ANNUAL MEETING

The Laboratory for Atmospheric and Space Physics of the University of Colorado will host the 14th Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society. The meeting will convene at the Hilton Harvest House in Boulder, Colorado from October 19 to 22, 1982.

Contributed reports from all areas of planetary science are welcome. Abstracts must be submitted in standard AAS format and must be received by August 15, 1982. Titles must be received by August 1, 1982. Send titles and abstracts to the program chairman, Robert A. West, LASP, Campus Box 392, University of Colorado, Boulder, CO 80309. Questions regarding travel and accommodations should be directed to the local arrangements chairman, Larry W. Esposito, at the same address.

THEORY INSTITUTE IN SOLAR TERRESTRIAL PHYSICS

The Theory Institute in Solar Terrestrial Physics will be conducted on the Boston College campus, August 9-26, 1982. The purview of the Institute encompasses solar and heliospheric physics, magnetospheric physics including planets other than Earth, thermospheric physics, coupling processes among these fields, and the basic plasma theory closely related to these fields. The Institute will consist of a School followed by a Theory Conference.

The first two weeks of the Institute will consist of a School with invited speakers lecturing broadly on concepts and fundamental principles of solar-terrestrial physics. The plan is for the published proceedings of the School to represent, at least in outline form, the scope and depth of a suitable curriculum for a well-trained scientist specializing in the field of solar-terrestrial physics.
The last four days of the Institute will constitute the first Theory Conference in Solar-Terrestrial Physics. Presentations will be based upon invited and contributed contributions selected by a program committee. Only theoretical papers (mathematical analysis, computer simulation, physical modelling) will be included in the Theory Conference.

Boston College housing and dining facilities will be reserved for Institute participants upon request. Pre-registration should be completed before June 1, 1982. The registration fee for the School and Theory Conference is $150.00; for the Theory Conference only it is $90.00. Some financial assistance for registration and housing costs is available to qualified graduate students. There are no travel funds available.

To obtain more information, send name and full mailing address to Maura Hagan, Department of Physics, Boston College, Chestnut Hill MA 02167 USA.

11TH INTERNATIONAL RADIOCARBON CONFERENCE

The 11th International Radiocarbon Conference will be held at the University of Washington, McCarty Conference Center, Seattle Washington, June 21-25. Pre-registration will be accepted until May 20.

Sessions scheduled for the conference include: General aspects of $^{14}$C technique; Natural $^{14}$C variations; Anthropogenic $^{14}$C variations; Archaeology; Hydrology; Oceanography; $^{14}$C applications; and, Technical aspects of accelerator mass spectrometry. Other events scheduled include a tour of the Quaternary Isotope Laboratory and/or the Nuclear Physics Laboratory, a Conference cruise and salmon dinner, and a post-conference field trip to Mount Rainier dealing with "Holocene environmental records."

The organizing committee for the conference is Minze Stuiver, Pieter M. Grootes and George W. Farwell. For more information about this conference contact them at the Quaternary Isotope Laboratory, AK-60, University of Washington, Seattle WA 98195. (206/543-6327) For information about registration contact Ms. Sharon Christiansen, Conference Coordinator, 206/543-9233.

AN ASTRONOMY WORKSHOP FOR TEACHERS

As part of its 93rd annual scientific meeting, the Astronomical Society of the Pacific is sponsoring a two-day workshop on teaching astronomy in the elementary and secondary grades. The sessions will be held Saturday and Sunday, June 26 and 27, 1982, at the University of California, San Diego in La Jolla.

The first day of the workshop will emphasize specific classroom activities and a variety of resources for teaching astronomy. The second day will feature a series of non-technical lectures by noted astronomers on new developments in our understanding of the universe. Among the speakers will be Drs. David Morrison, Halton C. Arp, William Kaufmann, and George Abell.

Credit for the workshop will be available through the University of California. No background in science or math will be required.

For a full description of the workshop and an application form, please send a stamped self-addressed envelope to:

Educator's Workshop
A.S.P.
1290 24th Avenue
San Francisco, CA 94122

COSMIC DUST SAMPLES MADE AVAILABLE FOR SCIENTIFIC STUDY

Cosmic dust particles, which are thought to originate from comets, can be obtained for scientific study from the Planetary Materials Curatorial Branch at NASA's Johnson Space Center, Houston. The Planetary Materials Facility at Houston has been the location of the lunar samples and more recently for meteorite samples retrieved from the Antarctic.

The microscopic particles are collected at altitudes of 18,300 meters (60,000 feet) by NASA research aircraft using specially designed collectors. The collectors are returned to an ultra clean laboratory at Johnson where the particles are extracted from the collectors and prepared for scientific study. Particles are examined with optical and scanning electron microscopes, and their pictures and elemental signatures are compiled in catalogs. The catalogs can then be used by scientists in planning research and requesting specific samples.
Cosmic dust represents a new source of extraterrestrial material which can be studied in the laboratory. Lunar samples have enabled scientists to unravel much of the history of the Moon and some information about events which occurred early in the history of the solar system. Meteorites were apparently once a part of asteroids or comets, and provide evidence for events which occurred when, or even before, the solar system was formed. Cosmic dust particles are almost certainly grains from comets, which had been active fairly recently, and thus could provide another window to the history of the solar system.

Experiments that may be performed using cosmic dust grains include: scanning electron micrography to obtain images of the grain; analytical electron microscopy to determine chemical composition; high voltage transmission electron microscopy to determine internal structure; and mass spectrometric analysis for noble gases to obtain information about the exposure history of the grains in space.

The cosmic dust grains are so small that it would take a line of 100 of them to cross the head of a pin. Techniques for analyzing very small quantities were applied to lunar samples and meteorites and will be applied to analyze directly debris from comets.

ASTRONOMERS DETECT VIOLENT EJECTION FROM A STAR NEAR SUN

What is believed to be the first direct evidence of a violent ejection or jet from a star relatively close to the Sun has been detected by astronomers at NASA's Goddard Space Flight Center, Greenbelt, MD, the University of Maryland and the Lick Observatory at the University of California.

Most of the jets that are observed by astronomers indicate violent ejection of matter from the center of active galaxies or quasars. This most recent observation, however, reveals an extraordinary jet structure in a binary star system near the Sun, known to astronomers as the star R Aquarii. In contrast to the only other star known to have jet structure in our galaxy, SS 433, R Aquarii is much closer to the Sun, a distance of only 750 light years.

Dr. Andrew Michalitsianos of Goddard describes the jet, seen with the Very Large Array radio telescope located at Socorro, NM, as "an extended, well collimated (directional) jet which is coincident with a similar structure seen in visible light by Dr. George Herbig with the 305-centimeter (120-inch) telescope at Lick Observatory. This jet has a length of about 20 times the size of our solar system."

Dr. Minas Kafatos, on leave from George Mason University, Fairfax, VA, who also is at Goddard, estimates that the material in the jet could be moving at 2,000 kilometers (1,080 miles) per second.

"We believe that the presence of a jet in R Aquarii is evidence for an accretion disk of material captured by an unseen star companion of the cool red variable R Aquarii," said Kafatos. The accretion disk, estimated to have a diameter 25 times the Earth's distance from the Sun, would be just observable with Space Telescope (due to be launched on the Space Shuttle in 1985) because of the proximity of this system to the Sun. Therefore, R Aquarii may be the only object in which astronomers can directly examine the formation of jet structure. As Star SS 433 is 20 times farther from the Sun than R Aquarii, it would not provide a favorable opportunity for observation, astronomers said.

In a related development, radio observations of the jet structure by Robert Sopka of the University of Maryland, showed a previously unknown radio source. If proven to be associated with R Aquarii, it may be material previously ejected during an outburst seen in the early 1930's.

New observations are planned by the Goddard astronomers using NASA's orbiting International Ultraviolet Explorer telescope satellite.

McGETCHIN SUMMER STUDIES WINNERS ANNOUNCED

Winners of the 1982 McGetchin Volcano Fund awards have recently been announced by the Selection Committee. The Fund, only in its second year, was established to support field work for undergraduates or masters candidates in volcanology. From the many outstanding proposals submitted, the Committee selected the following four students this year:

1. William Chadwick, a graduate of Colorado College, will go to New Zealand for five months where he will
work with the Department of Scientific and Industrial Research on expanding and upgrading their deformation monitoring system in the Taupo Volcanic Zone.

2. Jerry Prosser, a graduate student at Dartmouth, will work this summer at the USGS's Hawaiian Volcano Observatory doing deformational studies of Mauna Loa and Kilauea volcanoes.

3. Ricardo Livieres, a graduate student at Tulane University, will do his field work at the Sanganguey Volcano, Nayarit, Mexico where he will study and map the stratigraphic relationships of erupted material and collect samples for laboratory analyses back at his university.

4. Charles Criswell, a graduate student at the University of New Mexico, will study the surface morphology of ash-flow tufts at Mt. St. Helens, Washington.

The Selection Committee was very pleased with the quality of proposals this year and only regretted that all of them could not be funded; nevertheless, four young volcanologists will be able to participate in important and interesting field studies which would not otherwise have been possible.

1982 LPI SUMMER INTERNS - June 14-August 20, 1982

Applications from 206 very qualified and talented undergraduates representing colleges and universities from the United States and several foreign countries have been evaluated for the 1982 Lunar and Planetary Institute Summer Intern Program. The number of applicants for this highly successful program has more than doubled since its inception in 1977. The twelve who were selected for the 1982 program will be directed in a wide variety of research projects by researchers from both the LPI and the Johnson Space Center. In addition to a written report of their research activities following the ten week study, Interns will have the opportunity to present their research to colleagues and advisors during a series of weekly seminars. The 1982 Interns, their advisors and projects are listed below.

Teresa C. Atwill, University of Hawaii

ADVISOR: Dr. Charles A. Wood, NASA Johnson Space Center

PROJECT: Remote sensing - Image enhancement Mg/Al x-ray fluorescence lunar data set - Preliminary geologic interpretation of enhanced images.

Eileen A. Bruckenthal, Brown University

ADVISOR: Dr. Ernest Schonfeld, NASA Johnson Space Center

PROJECT: Characterizations and microthermometric analysis of fluid inclusions in meteorites. The technique involves careful petrographic (microscopic) study of the fluid inclusions, followed by visual observations and precise temperature determinations of phase changes during controlled heating and freezing. The objective is to determine temperatures of homogenization and freez-
ing, which are then used to constrain fluid compositions. Plenty of work of this type needs to be done on both achondrite and chondrite meteorites in which we have found fluid inclusions. The results will provide extremely important constraints on the origin of chondrules, the petrologic processes that give rise to basaltic meteorites, and the nature parent bodies.

David C. Gosselin, College of St. Thomas

ADVISOR: Dr. Peter Schultz, Lunar and Planetary Institute

PROJECT: This project involves a detailed inventory of recent impacts on the Moon from Apollo panoramic and metric photographs with statistical analysis of their distributions.

Sarah Ann Hokanson, Wellesley College

ADVISOR: Dr. Everett K. Gibson, NASA Johnson Space Center

PROJECT: Study of Martian soil analogs - study the abundance and distributions of water soluble cations and anions in soils and cores from the Dry Valleys of Antarctica using ion selective electrode techniques.

Kathleen M. Kordesh, Indiana University

ADVISOR: Dr. David McKay, NASA Johnson Space Center

PROJECT: The thrust of the project will be to create a data base for cosmic dust data using such information as particle size and shape, particle chemistry, particle density, etc. Some of this data already exists, much of it from electron microscope observations. Some of the project will include additional data collection using the Scanning Electron Microscope. The data base will be initially created from an existing data management program running on the JSC PDP11/45. In addition, the intern will make cross correlations of various properties to help develop natural categories and subdivisions. Computer graphics will also be used to display properties and categories of cosmic dust. The ultimate goal is to make interpretations related to the origin and geologic history of cosmic dust particles and their relation to meteorites, comets, and the origin of the solar system.

Raymond L. Ladbury, Colorado State University

ADVISOR: Dr. Steven Croft, Lunar and Planetary Institute

PROJECT: The dominance of water ice with its unusual physical properties in the crusts and mantles of the icy satellites of Jupiter and Saturn, in contrast to the rocky crusts of the terrestrial planets, suggests at least the operation of ordinary geological processes under unusual conditions, and possibly the dominance of geophysical processes with no significant terrestrial analog. A variety of unusual and little understood geologic structures are found on the icy satellites, particularly on Ganymede, which may have arisen due to the peculiar response of ice as a geological material. The Intern project will combine photogeology and physical modeling by computer (and possibly some experimental work) to investigate the possible origins and modification of a selected subset of these icy geologic structures.

Wen Jin Meng, California Institute of Technology

ADVISOR: Dr. Paul Morgan, Lunar and Planetary Institute

PROJECT: Recent studies at LPI have used petrologic constraints to estimate lithospheric thinning rates in East Africa, using a thermal thinning model which assumes the lithosphere to be stationary with respect to the heat source which causes lithospheric thinning and volcanism. A similar model has been used to explain the topography and heat loss of Venus. This model will now be extended to examine the effect of a sublithospheric heat source on a horizontal component of motion relative to the heat source. The project will involve some math and computing to develop the moving lithosphere model, and use of published topographic and petrologic data from the Earth and possibly Mars and Venus to constrain the model.

Cynthia L. Moore, New Mexico Institute of Mining & Technology

ADVISOR: Dr. Geoffrey Wadge, Lunar and Planetary Institute

PROJECT: Morphology of lava flows on the Earth and terrestrial planets: indicator of magma rheology and composition. The project will ex-
The Venus Orbiting Imaging Radar mission budgets have been deleted from the fiscal year 1982 and 1983 Federal budgets. This resulted from reconsideration of what was affordable after approval of VOIR as a new start in FY 1982 at a total cost of $680 million in real year dollars.

The mapping of Venus remains the highest priority for planetary starts. How well this can be done is constrained at present by budget. There is a general feeling that any planetary mission must cost less than $300 million to be acceptable.

The Jet Propulsion Laboratory was instructed by NASA to go ahead and place contracts with the companies selected to study the implementation of a simpler and less expensive Venus spacecraft and synthetic aperture radar systems. Working with Martin Marietta Corporation for the spacecraft and Hughes Aircraft Corporation for the SAR, we are designing a mission to meet most of the prime objectives of VOIR within the new cost constraints.

The new mission is currently referred to as Venus Mapper. The approach is to greatly simplify the mission and use existing spacecraft hardware and software or existing designs where possible. A preliminary study of such a spacecraft suggests that the mission is feasible using a design modified from a spacecraft designed for the Halley Intercept Mission, which was studied last year. Residual flight quality hardware came from Viking, Voyager, Galileo, and ISPM. In addition, redundancy will be reduced and we will use a digital radar processor being built at JPL for use by other programs.

The greatest reductions in cost arise from the fact that over the past two years we have developed confidence from experience with digital radar processing that we can operate a SAR in an elliptical orbit. The original VOIR required a nearly circular orbit to facilitate SAR processing. With an elliptical orbit the requirements on the spacecraft are greatly relaxed and we can use a much less costly approach.

The spacecraft design is elegant, meeting the basic requirements, but constrained to existing capabilities provided by other systems such as the Deep Space Network. The SAR antenna, a residual from Voyager, serves as the primary experiment antenna near periapsis and as the communications antenna near apoapsis. The only moving parts are the solar panels, which rotate to properly track the Sun.

Details of the SAR performance are still being evaluated, but in general requirements for mapping have always been to do as well as Mariner 9 did for Mars. VOIR went beyond this, requiring a complete map with constant resolution and viewing geometry. This must be given up in elliptical orbit; the incidence angle (from vertical) varies from about 50° at the equator to around 20° near the poles. Most of the geologists who work with radar feel that this may turn out to be helpful. This range of incidence angles is bounded by the geometry for which we have
experience using spaceborne radar, Seasat at 23° and SIR-A at 45°.

It turns out that the resolution doesn't vary significantly. It will be possible to process all the images to at least 300 m radar resolution, probably sampled with 150 m or smaller, square pixels. Although comparison with equivalent television or photographic resolution is difficult, this would be approximately equivalent to a photographic line-pair resolution of 600 m. With the radar, the dynamic range is greater but the number of discernible gray levels is fewer.

All images would be processed and mosaics constructed from them. The process of mosaic construction is somewhat complicated by the fact that we will be assembling many narrow strips, between about 10 and 30 km wide, and the position of the strips is determined by how well we know the spacecraft position. It is anticipated that this error can be kept smaller than 3 km for most of the mission, well within the overlay area of adjacent image strips.

In addition to imaging, the Venus Mapper will meet the other two prime objectives of VOIR -- altimetry and gravity. The altimetry data will be significantly better than Pioneer Venus altimetry, with more than a factor of 10 greater sample density. The gravity experiment can complete the gravity map of Venus, used with the Pioneer Venus gravity data, for feature wavelengths of 700 km or smaller. VOIR would have acquired a gravity resolution of about 300 km.

Dr. R. S. Saunders is Project Scientist for the Venus Mapping Mission at Jet Propulsion Laboratory, Mail Station 183-501, 4800 Oak Grove Dr., Pasadena, Calif. 91109.

NEW VENERA RESULTS
by
V. L. Sharpton
Dr. J. W. Head

Soviet probes have again penetrated the thick Venusian cloud cover and survived the harsh surface conditions to send back stunning views of the mysterious Venus surface. The two spacecraft, Venera 13 and 14, were each equipped with a pair of cameras designed to capture the Venus landscape from two panoramic views aimed fore and aft. Resolution is vastly superior to that of their 1975 predecessors, Venera 9 and 10 and is comparable to Viking. In addition, by scanning their scenes successively through red, green and blue filters, the camera systems could provide color images.

The photo shown in Figure 1 was taken by Venera 13 shortly after its March 1 landing at 7°30'S latitude, 303° longitude, just east of Phoebe Regio. Figure 2 shows a view of the surface from Venera 14 which touched down March 5 about 950 kilometers southeast of its twin (13°15'S, 310°99'E). The checked strip in each picture is a color-test chart for balancing color images. The jagged "teeth" in the foreground are attached to the spacecraft's landing ring and were designed to stabilize the landers in their descent through the Venus atmosphere. The detached pieces of hardware just left of center in both photos are the jettisoned covers which protected the cameras' viewing windows during transit.

The view from Venera 13 is that of a smooth but fractured surface, topped with rock debris of various sizes within a darker, fine-grained matrix. These rock fragments appear to be concentrated around the lander and may have resulted from its impact with the surface. The smoother areas could be either solid slabs of rock or a crust of fine particles cemented together by chemical processes associated with the atmosphere. Such "fines" may be wind-borne deposits or perhaps weathering products of chemical erosion acting on the underlying bedrock. With high surface temperatures and a caustic atmosphere the Venusian environment could produce and cement particles rapidly, even in the absence of Earth's chief weathering agent, water.
At Venera 14 the surface is quite different in appearance. The abundance of cobbles and pebbles seen at Venera 13 is absent. Instead the surface is characterized by a continuous exposure of flat-lying platy rock with a distinct layered appearance. The edges of the plates are angular and sharp, suggesting, as does the lack of fine-grained deposits, that this might be a relatively fresh surface.

The two most recent Venera probes were also equipped to perform X-ray fluorescence measurements which constrain certain elemental abundances on the planet's surface. As reported by Soviet scientists V. L. Barsukov and Yu. A. Surkov at the recent 13th Lunar and Planetary Science Conference in Houston, Texas, the data at the Venera 14 site are consistent with a surface composed of tholeiitic basalt, an important volcanic rock type which underlies the Earth's oceans and is also found in the lunar maria. The major element geochemistry of the Venera 13 sample, on the other hand, is indicative of leucite basalt, an exotic basaltic rock rich in potassium. On Earth, potassium basalts are often associated with regions of continental rifting.

Scientists will need months to pore over the Venera results before firm interpretations can be reached. One important objective is to integrate these "postage stamp" views of Venus into the global picture based on Pioneer Venus and earth-based radar data. Owing however to the extreme differences in scale and resolution between the Venera data and the radar, this task seems insurmountable. Perhaps, in the not-too-distant future a high resolution Venus radar mapping mission (see page 1) will provide the data needed to confidently bridge the gap in resolution. In the meantime scientists concerned with understanding the nature and evolution of Venus must be content with a thorough analysis and interpretation of the available data sets.

V. L. Sharpton and J. W. Head, Department of Geological Sciences, Brown University, Providence, RI 02912

Figure 1. The view from Venera 13

Figure 2. The view from Venera 14
VENUS RESEARCH TOPICS

A number of scientists from around the world are engaged in investigating the geology of Venus. Results of many of these studies were recently presented at two major conferences for planetary scientists: the annual meeting of Planetary Geology Principal Investigators held at Jet Propulsion Laboratory, Pasadena, Calif., on January 12-14 and the 13th Lunar and Planetary Science Conference at Johnson Space Center, Houston, Texas on March 15-19. A compilation of titles of papers dealing with Venus related topics published in the abstract volumes of these meetings is presented below:

Publication:


Oceanic Ridges, Transforms, Trenches Would be Seen in PV Altimetry Data—Even Under Venusian Ambient Conditions, R. E. Arvidson, 371.

Alteration of Rocks in Hot CO2 Atmospheres: Preliminary Experimental Results and Application to Venus, J. G. Gooding, 460-462.

Globes of the Planets, R. M. Batson and J. L. Ange, 479-480.

Publication:


Is the Intrinsic Density of Venus Greater than the Intrinsic Density of Earth?, K. A. Goettel, 265-266.


Volcanic Processes on Venus, J. W. Head and L. Wilson, 312-313.

Has the Earth’s Core Grown over Geologic Time?, E. Jagoutz and H. Wanke, 358-359.


A Case for a Weak Crust on Venus, H. Mizutani and H. Spetzler, 534-515.


Venus; Model for Exchange Between Crust and Mantle, J. L. Warner, 835-836.

Gravitational Effects on Caldera Formation, J. L. Whitford-Stark, 857-858.
plore potential geomorphic parameters of silicate lava flows from which rheology and magma composition can be inferred using simple fluid mechanical modeling. Research will involve some mathematical modeling, photogeologic interpretation and probably, use of computer graphics.

Joan Carol Pflugrath, Rice University

ADVISOR: Dr. Roger J. Phillips, Lunar and Planetary Institute

PROJECT: Venus and Earth appear to have undergone different evolutionary histories as witnessed by their grossly dissimilar surface physiographies, gravity fields and atmospheres. Of particular interest is the apparent absence of earth-like plate tectonics on Venus. Because of their similar size and mean density, however, these planets offer an ideal test for thermal history modeling in that one has the chance to discover which parameters might be important in explaining the divergent histories of these two planets. This project will consist of evaluation and computer modeling of the effects of geochemical, petrological, geophysical, and geological constraints on the thermal histories of Venus and Earth. The question of the requirements for lithosphere plate subduction will also be examined.

Cassandra J. Runyon, State University of New York, Fredonia

ADVISOR: Dr. Matthew Golombek, Lunar and Planetary Institute

PROJECT: Structural analysis of Martian grabens - analysis of faults bounding Martian grabens, and the tectonic importance of graben formation.
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P. O. Box 9140  
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Texas Star Party, Fort Davis, Texas  
Contact: David Clark  
2709 Colonial Dr.  
Carrollton TX 75007  
Telephone: 214/242-4908

May 31-June 4  
American Geophysical Union Spring Meeting,  
Philadelphia, Pennsylvania  
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June 15  
APPLICATIONS DEADLINE Planetary Volatiles  
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Quaternary Isotope Lab.  
AK 60  
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Boston College
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Telephone: 617/969-0100

August 15

ABSTRACTS DEADLINE Division for Planetary Science, American Astronomical Assoc.
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LASP, Campus Box 392
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August 17-26

XVIII General Assembly of the International Astronomical Union, University of Patras, Greece
Contact: Organizing Committee
XVIII General Assembly IAU
University of Patras
Patras. Greece

August 23-27

Contact: J. T. Gleave
Special Courses Division
University of Leeds
Leeds LS2 9JT United Kingdom

August 30-Sept. 2

International Conference on Planetary Rings (I.A.U. Colloquium no. 75), Toulouse, France
Contact: Centre National d'Etudes Spatiales
Dept. des Affaires Universitaires
18, avenue Edouard-Belin
31055 Toulouse CEDEX France

August 31-Sept. 2

International Conference on Very Large Baseline Interferometry Techniques, Toulouse, France
Contact: Centre National d'Etudes Spatiales
Dept. des Affaires Universitaires
18, avenue Edouard-Belin
31055 Toulouse CEDEX France
August 31-Sept. 2
First International Eclogite Conference,
Clermont-Ferrand, France
Contact: F.I.E.C.
Museum National d'Histoire Naturelle
Laboratoire de Mineralogie
61 Rue de Buffon
75005 Paris France

September 8-11
Third International Kimberlite Conference,
Clermont-Ferrand, France
Contact: T.I.K.C.
Laboratoire de Tectonophysique
Université de Nantes
2 Rue de la Houssiniere
44072 Nantes CEDEX, France

September 13-16
45th Annual Meeting of the Meteoritical Society, St. Louis, Missouri
Contact: Prof. Ghislaine Crozaz
Washington University
Box 1105
St. Louis, MO 63130

October 9-12
Conference on Planetary Volatiles
Arrowwood Conference center, Alexandria, Minnesota
Contact: Ms. Pam Jones
Lunar & Planetary Institute
3303 NASA Road One
Houston TX 77058
Telephone: 713/486-2150

October 18-21
Geological Society of America Annual Meeting, New Orleans, LA
Contact: GSA Headquarters
3300 Penrose Place
Boulder CO 80301
Telephone: 303/447-2020

October 19-22
Division for Planetary Sciences, American Astronomical Society, Boulder, CO
Contact: L. Esposito or R. West
University of Colorado
Dept. of Astro-Geophysics
Boulder CO 80309
November 15-18

Topical Conference on Chondrules and Their Origins, LPI, Houston Texas
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November 15-19

International Conference on Cometary Exploration, Budapest, Hungary
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MOON, MOTION, DYNAMICS, GRAVITY FIELD


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