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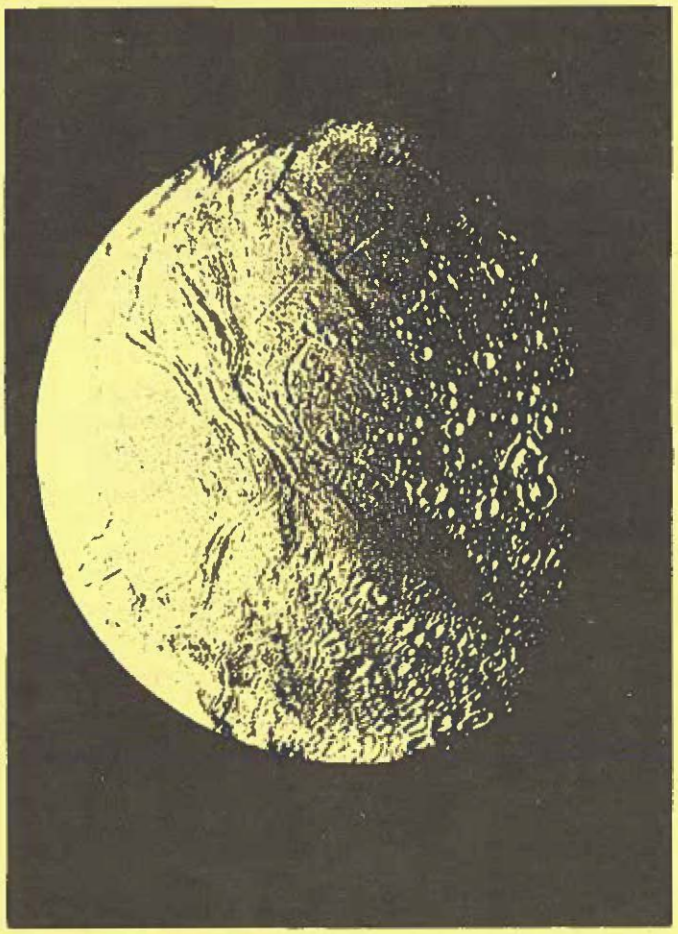
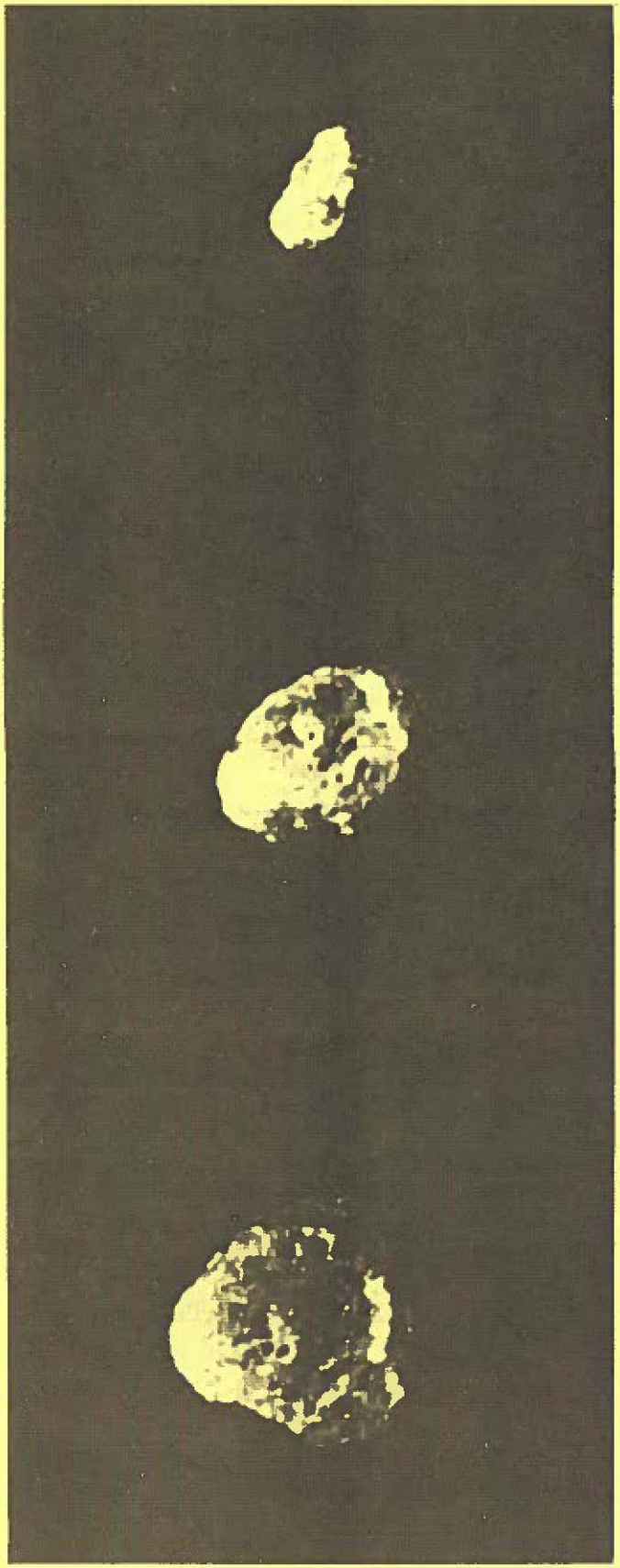


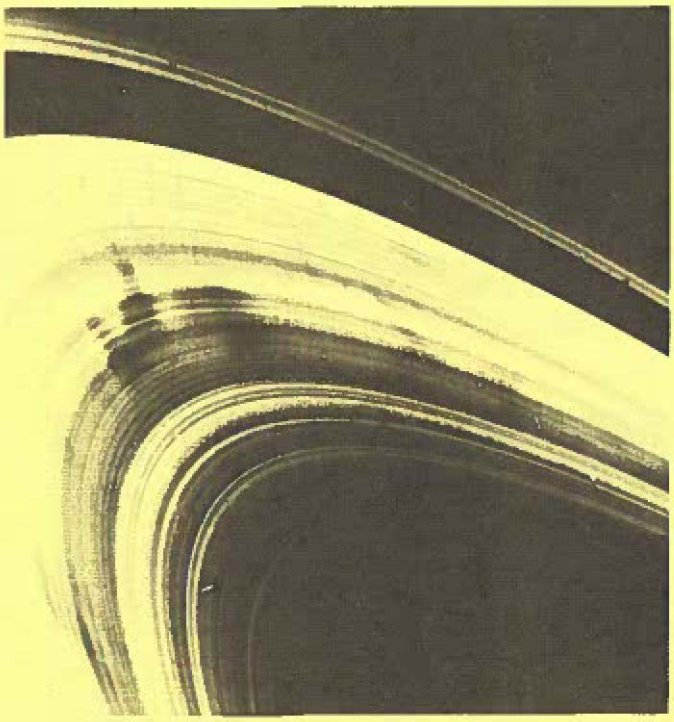
P-23956BW

This high-resolution filtered image of Enceladus was made from several images obtained Aug. 25 by Voyager 2 from a range of 119,000 kilometers (74,000 miles). It shows further surface detail on this Saturnian moon (also viewed in the accompanying release P-23955C/BW, S-2-50, imaged about the same time). Enceladus is seen to resemble Jupiter's Galilean satellite Ganymede, which is, however, about 10 times larger. Faintly visible here in "Saturnshine" is the hemisphere turned away from the sun.

Prominent dark spokes are visible in the outer half of Saturn's broad B-ring in this Voyager 2 photograph taken on Aug. 3, 1981 from a range of about 22 million kilometers (14 million miles). The features appear as filamentary markings about 12,000 kilometers (7,500 miles) long, which rotate around the planet with the motion of particles in the rings. The nature of these features, discovered by Voyager 1, is not totally understood, but scientists believe the spokes may be caused by dust levitated above the ring plane by electric fields; Voyager 2 photography of the rings edge-on, scheduled for Aug. 25, 1981, will provide an opportunity to test that theory. Because the Sun is now illuminating the rings from a higher angle, Voyager 2's photographs reveal ring structure from a greater distance than that seen by Voyager 1 in its November 1980 encounter.

P-23881BW





P-23925BW

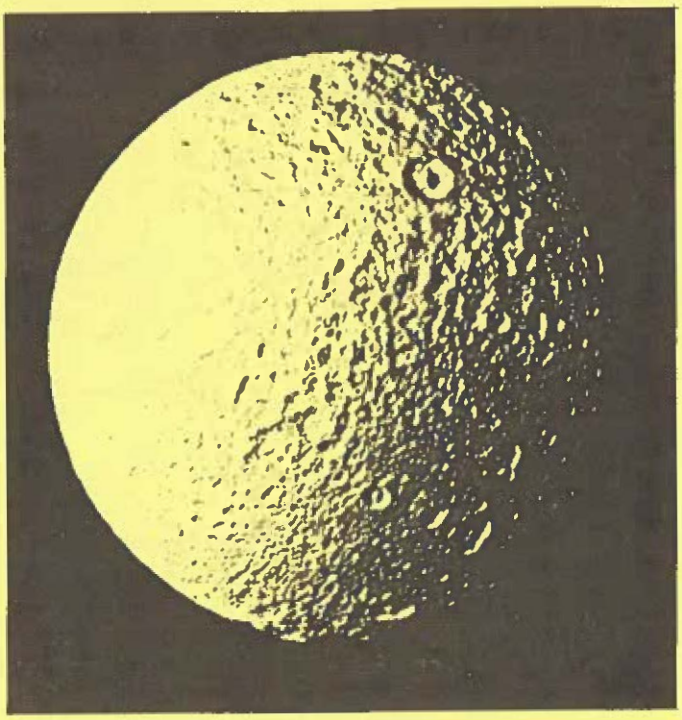
Voyager 2 obtained this high-resolution picture of Saturn's rings Aug. 22, when the spacecraft was 4 million kilometers (2.5 million miles) away. Evident here are the numerous "spoke" features in the B-ring; their very sharp, narrow appearance suggests short formation times. Scientists think electromagnetic forces are responsible in some way for these features, but no detailed theory has been worked out. Pictures such as this and analyses of Voyager 2's spoke movies may reveal more clues about the origins of these complex structures.

P-23932BW

These three views of Hyperion were obtained as Voyager 2 flew by this satellite of Saturn. They were taken (from top) the morning of Aug. 23 from a range of 1.2 million kilometers (740,000 miles), the morning of the 24th from 700,000 kilometers (430,000 miles) and at noon the 24th from 500,000 kilometers (310,000 miles). Together, they show the changing aspect of the satellite as Voyager moved in for closer views. Hyperion, roughly 360 kilometers by 210 kilometers (220 miles by 130 miles) and shaped like a hamburger, is probably not in a gravitationally stable position. Its surface is pock-marked with many meteorite-impact craters. It is possible that one of these impacts jostled Hyperion out of position and that the satellite will swing back gradually.

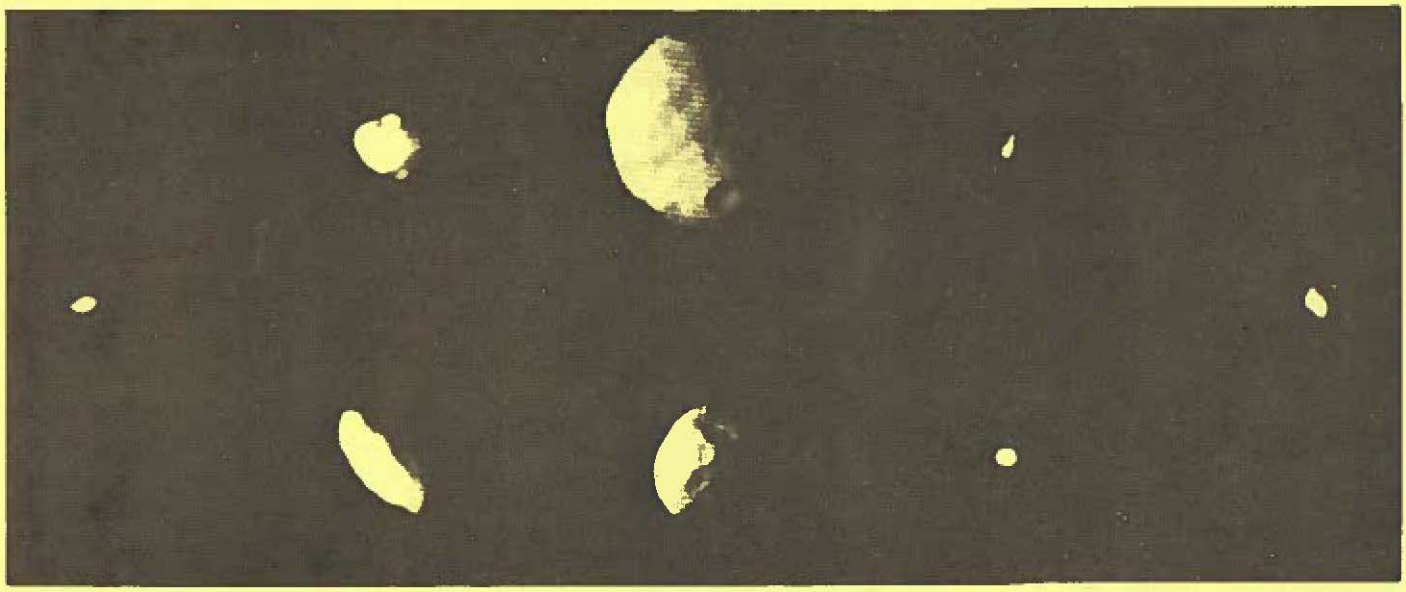
P-23920BW

Voyager 2 photographed Iapetus, the outermost of Saturn's large satellites, Aug. 22 from a distance of 1.1 million kilometers (680,000 miles). This image, which shows features as small as 21 kilometers (13 miles) across, has been processed to reveal as much detail as possible of the bright, icy regions of the northern trailing hemisphere. The number and forms of impact craters here appear similar to those of the heavily cratered surfaces of the inner icy satellites (such as Rhea and Mimas) photographed by Voyager 1. This similarity suggests an ancient crust dating back to the early history of the solar system. Iapetus is noteworthy for the very dark material (seen here in the lower and right-hand parts of the picture) that apparently covers the satellite's ice crust primarily on its leading hemisphere. Iapetus has a diameter of 1,450 kilometers (900 miles). Voyager 2 passes about four times closer to the satellite than did Voyager 1 last fall.



P-24065BW

This Voyager 2 photograph of Tethys shows objects about 5 kilometers (3 miles) in size and is one of the best images of the Saturnian satellite returned by the spacecraft or its predecessor, Voyager 1. Voyager 2 obtained this picture Aug. 26 from a range of 282,000 kilometers (175,000 miles). It has been specially processed by computer to bring out fine detail on the surface. A boundary between heavily cratered regions (top right) and more lightly cratered areas (bottom right) is very similar to boundaries on the moons Dione and Rhea, indicating a period of internal activity early in Tethys' history that partially resurfaced the older terrain. The large crater in the upper right lies almost on the huge trench system that girdles nearly three-fourths of the circumference of the satellite. The trench itself is seen in this image as a linear set of markings to the lower left of the crater. The trench, several kilometers deep, is indicative of a cold, stiff ice crust at the time of its formation. Formation of this trench system could have resulted from the expansion of Tethys as its warm interior froze.



P-4399347

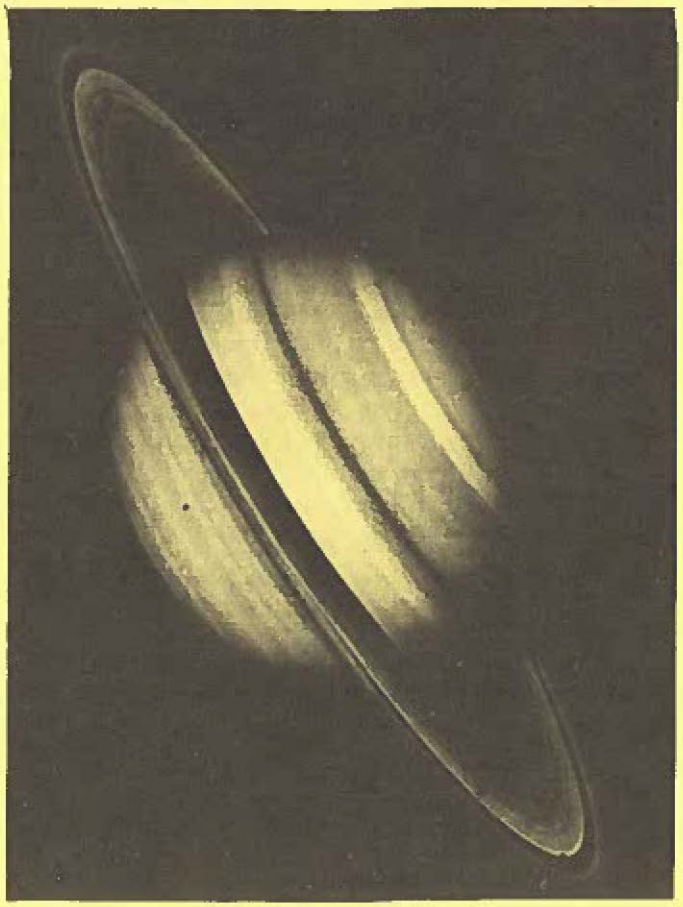
This family portrait shows the smaller satellites of Saturn as viewed by Voyager 2 during its swing through the Saturnian system. The following chart corresponds to this composite photograph (distance from the planet increased from left to right) and lists names, standard numerical designations and approximate dimensions (radii where indicated) in kilometers:

	1980S26 Outer F-ring shepherd 120 by 100	1980S1 Leading co-orbital 220 by 160	1980S25 Trailing Tethys trojan rad: 25	
1980S28 Outer A rad: 30	1980S27 Inner F-ring shepherd 145 by 70	1980S3 Trailing co-orbital 140 by 100	1980S13 Leading Tethys trojan rad: 30	1980S6 Leading Dione trojan rad: 30

These images have been scaled to show the satellites in true relative sizes. This set of small objects ranges in size from small asteroidal scales to nearly the size of Saturn's moon Mimas. They are probably fragments of somewhat larger bodies broken up during the bombardment period that followed accretion of the Saturnian system. Scientists believe they may be mostly icy bodies with a mixture of meteorite rock. They are somewhat less reflective than the larger satellites, suggesting that thermal evolution of the larger moons "cleaned up" their icy surfaces.

P-23937BW

The extensive ribbonlike cloud structure in Saturn's atmosphere is visible in this Voyager 2 green-filter photograph, obtained Aug. 23 from a range of 2.5 million kilometers (1.6 million miles). Some Voyager scientists have interpreted the ribbon to be a large-scale atmospheric wave; it is believed to lie in a rapid eastward-moving jet-stream. The presence of vortices adjacent to the ribbon itself will help scientists understand the relationship between such structures and the strong jetstreams present in Saturn's atmosphere. The smallest features visible in this photograph measure about 50 kilometers (30 miles) across.



P-23887C/BW

This true color picture was assembled from Voyager 2 Saturn images obtained Aug. 4 from a distance of 21 million kilometers (13 million miles) on the spacecraft's approach trajectory. Three of Saturn's icy moons are evident at left. They are, in order of distance from the planet: Tethys, 1050 kilometers (652 miles) in diameter; Dione, 1,120 kilometers (696 miles); and Rhea, 1,530 kilometers (951 miles). The shadow of Tethys appears on Saturn's southern hemisphere. A fourth satellite, Mimas, is less evident, appearing as a bright spot a quarter-inch in from the planet's limb about half an inch above Tethys; the shadow of Mimas appears on the planet about three-quarters of an inch directly above that of Tethys. The pastel and yellow hues on the planet reveal many contrasting bright and darker bands in both hemispheres of Saturn's weather system.

MARS PEOPLE MEET IN PASADENA

Anne Lutz-Garihan

The *Third International Colloquium on Mars* was held August 31-September 2, 1981, at the California Institute of Technology, Pasadena CA. The conference, attended by 215 scientists, was held to survey the current state of analysis of data about Mars obtained from Viking, earlier space missions, and earthbased observations. Various aspects of Mars were considered in sessions on geophysics, volcanism, geology, atmosphere, and atmosphere-surface volatile regimes. A brief review of the meeting is given below.

One of the most commonly used procedures for studying Mars is to search for analogous features and processes on other planets, especially Earth, to try to understand the origin of features and the importance of various processes. In some cases, this led to more than one interpretation, so that not all ideas were unanimously agreed upon. One example of planetary comparison was a study by E.K. Gibson of the soils present within the Dry Valleys of Antarctica. This area may be the best terrestrial analog of the martian surface. The Antarctic soils have enriched sulfur and chlorine concentrations and are similar to soils that have been analyzed on Mars. These enriched zones were produced by normal weathering processes on Earth, and it is likely that similar processes produced them on Mars. Landform characteristics on Mars were also compared to each other in the quest for information about their origin. For example, areas near the present martian equator bear numerous similarities to the present polar deposits, including thick layered deposits, chasma-like valleys, and pedestal craters. This interpretation is, however, quite controversial.

Direct measurements and observations by the Viking orbiters and landers were the sources for interpretations involving the surface and atmosphere of Mars. Some instruments have furnished data extending over the course of a martian year or even longer. The radiation balance at the poles throughout a year, for example, was determined by measuring both the rate of thermal emission and rate of absorption. One result of this study by D.A. Paige is the observation that both the north and south poles emitted more energy then they absorbed over the year. This excess emitted energy must have been transported to the polar regions from lower latitudes by the atmosphere. Earth-based measurements are also still important; for example, earthbased radar is aiding in terrain analysis of Mars.

Laboratory experimentation provided another method for arriving at hypotheses concerning the origin of martian features. Wind abrasion experiments by R. Greeley, et al., provided new ideas that could help resolve one conflict. Near the Viking landers are surfaces with fresh-looking craters whose frequency indicates an old surface; however, the estimated rate of abrasion from the experiments is high. Possible explanations are that windblown sand particles may be of such a composition that they are ineffective agents of abrasion; or the climate differed in the past; or the cratered surfaces were covered and later exhumed.

Several papers dealing with the Tharsis region included geophysical considerations and calculations as another way of studying Mars. Geophysical data include gravity analyses that show excess subsurface mass at Tharsis, and these data have been combined with studies of topography, isostasy, and tectonic features. Such combinations are being used in the search for answers to such questions as the nature of the topographic high (whether it is due to uplift or volcanic construction), the origin of fractures and ridges associated with Tharsis, and the petrology of the martian mantle.

Simulations and mathematical modeling comprise another method of working with martian data. Dust storms, cratering processes, and cloud formation were all subject to such modeling, and the models were tested when possible by comparison with actual observations.

There were many maps at the meeting including the Mars Consortium global maps which accommodate the growing amount of quantitative information in 18 different maps oriented toward computer-assisted analysis. Other maps displayed in Pasadena were arctic water vapor maps, an inventory of eolian features, color-enhanced albedo maps as related to soil stratigraphy, and a detailed topographic map of Olympus Mons.

The Mars Colloquium banquet was held on Tuesday with Carl Sagan as the after-dinner speaker. He spoke of our exploration of Mars in the past, and how we might most successfully do it in the future. All of the talks at the Colloquium pointed to the need for future missions to Mars. Although we can do much more with the data at hand, most of the questions about Mars cannot be fully answered until we return there.

A volume of abstracts of the papers presented at the Colloquium has been prepared as Lunar and Planetary Institute Contribution No. 441. Copies are available from the Library/Information Center at the LPI for $3.00 U.S., $10.50 foreign countries air printed matter or $4.50 surface mail. Please include check or money order with your order.

A volume of the proceedings papers will be published as an issue of the Journal of Geophysical Research sometime next year.

EARLY CRUSTAL GENESIS PROJECT MEETING

The first meeting of the *Early Crustal Genesis (ECG) Project* was held at Airlie House, Warrenton, Virginia, November 13-17, 1981. The overall goal of the ECG Project is to develop and refine a set of testable models for formation and evolution of the crusts of the terrestrial planets, emphasizing both their similarities and differences. To this end, over one hundred scientists from the U.S. and eight other countries (Australia, Canada, Denmark, England, Germany, India, South Africa, and Zimbabwe) met to formulate the long-range research plans of the ECG effort. Basic research issues were outlined and reviewed in eight subject areas: Planetary Volatiles, Physical and Chemical Evolution, Surface Processes, Planetary Formation, Metallogenesis, Crustal Features and their Development, Tectonics, and Paleobiology.

A key result of this meeting will be the *ECG Research Plan* (to be released in early-to-mid-1982), which will include scientific information (the current status of ECG research, what research is needed to produce significant advances, what accomplishments can be realistically expected over the next ten years), as well as organizational information (suggestions for the best approaches to the research, modes of communication, sources of funding, and nature of coordination between various government agencies, panels and commissions).

Those interested in further information should request the following publications:

LPI Technical Report 81-04
Workshop on Early Crustal Genesis: Implications from Earth, compiled by W. C. Phinney.
Report of a Lunar and Planetary Institute Workshop held November 3-5, 1980. 45 pp. U.S. $3.00; Foreign Air $5.00; Surface $3.00

LPI Technical Report 81-08
Concept for a Research Project in Early Crustal Genesis, compiled by R. J. Phillips and L. Ashwal.
"An interim document to serve the ECG Project until early 1982, when a detailed research plan will be released." Based on the deliberations of three meetings (January, March and May, 1981) of an *ad hoc* steering committee charged with the task of developing a project philosophy. 41 pp. U.S. $3.00; Foreign Air $5.00; Surface $3.00

Orders accompanied by remittance should be sent to:

Library/Information Center
Lunar and Planetary Institute
3303 NASA Road One
Houston TX 77058
USA

WORKSHOP ON MAGMATIC PROCESSES IN EARLY PLANETARY CRUSTS

The "Workshop on Magmatic Processes in Early Planetary Crusts" was held on August 3-9, 1981 in Billings and Nye, Montana. The objects of this workshop were to review the current state of knowledge on lunar highlands pristine samples and terrestrial layered complexes, and to discuss the theories of origin that have been proposed for these two types of cumulate-textured samples. The convening of this workshop in Montana allowed field trips to the Stillwater complex where a full range of magmatic cumulates was observed in geologic context.

The agenda for the Workshop was as follows:

The first day began with keynote presentations reviewing occurrence and characteristics of terrestrial layered intrusions. These talks were followed by presentations reviewing the pristine lunar highland samples. A session on anorthositic rocks completed the first day.

The second day of the workshop was devoted to a review of the processes commonly acknowledged to play a role in the genesis of magmatic cumulates and to an introduction of a number of processes which have not yet become widely recognized.

On the third day of the workshop, discussion centered on the economic mineralization of the Stillwater's newly-discovered Platinum-Paladium horizon. The processes responsible for the mineralization are not known and the three competing hypotheses discussed touched on most of the interesting scientific issues raised in the previous discussions. Furthermore, because the concentration processes responsible for the mineralization are also those responsible for depletions of these elements elsewhere, an under-

standing of these processes would be valuable in understanding the lunar siderophile-element depletions.

Three days of field trips were organized to inspect the sections of cumulate rocks in the Stillwater complex. The venerable, 1st-order story of crystallization and gravitational settling of crystals is a very appealing explanation for the gross properties of this stratiform intrusion. However, it was very obvious in the field that the processes responsible for forming the cumulate layers must be more complex than implied by this simple theory. Of particular interest and significance to the lunar investigators present was the realization that virtually the entire range of pristine lunar highlands rock types could be and was observed in a single outcrop. An additional field trip was devoted to the Archean basement rocks into which the Stillwater was intruded.

Co-conveners of the workshop were Dr. D. Walker, Harvard University, and Dr. I.S. McCallum, University of Washington. Logistic and administrative support was provided by the Lunar and Planetary Institute. An LPI Technical Report containing abstracts of the presentations, a summary of the meeting, and the guides for the field trips is being prepared.

VENUS ENVIRONMENT MEETING IN CALIFORNIA

The First International Conference on the Venus Environment was held in Palo Alto, California, November 1-6, 1981.

As a result of recent findings by the several Pioneer Venus craft, the USSR Venera landers, Mariner, and other work, more information exists now about Venus than ever before. Scientists say that much of this new data is well understood, and the conference should produce a comprehensive description of Venus, the Earth's closest and twin planet.

Attendees at the five-day conference included virtually all of the world's Venus experts. Of the 188 presentations, 18 were papers by authors from France, Germany, the USSR, England, Italy, India, Israel, and Mexico. Five of the scientists attending are from the USSR. A total of 14 of the 118 presentations were invited papers, 72 were contributed papers, and 32 were poster talks tied in with week-long exhibits.

Subjects covered were: Venus' surface and interior, and the composition, structure, and origin of its atmosphere. Scientists also discussed motions, clouds, and thermal balance of Venus' atmosphere, plus the planet's ionosphere and solar wind interactions. Typical of expected "new looks" at Venus was the first survey of density distribution in the crust, comparisons of this with topography, and discussions of Venusian plate tectonics or lack thereof. Other examples were: many new pictures of the planet, and the first movie of rotation of Venus' clouds.

The conference is co-chaired by NASA's Ames Research Center, Mountain View, California, and the University of Arizona, Tucson. The University will publish a book, based on the conference papers, which is expected to be the definitive work on the planet for a number of years. Following the conference, a special issue of Icarus will be devoted to the papers.

Some copies of the abstracts and program may be available after the conference. For information contact Dr. L. Colin, NASA/Ames Research Center, Mail stop 245-1, Moffett Field, CA 94035. (415/965-5519)

LPI/NAS COSPONSOR IMPACTS CONFERENCE

The Lunar and Planetary Institute and the National Academy of Sciences co-sponsored a conference entitled "Large Body Impacts and Terrestrial Evolution: Geological, Climatological, and Biological Implications", on October 19-22 in Snowbird, Utah. Dr. L.T. Silver, California Institute of Technology, was convener of the meeting.

Major topics addressed by the attendees at the meeting included:

1. Nature and flux of near-Earth objects and the geological evidence of their interactions
2. Physics of high energy impacts
3. Biological record and evidence for catastrophic extinction
4. Searching the extensive geological record for physical evidence of major impacts
5. Meteorological and climatological consequences of large scale impacts

Abstracts of papers presented to the conference have been assembled into a volume published as LPI Contribution No. 449. Copies are available from the Library/Information Center, LPI, for U.S. $3.00; Foreign air mail $5.00, surface $3.00. Please include payment with your order. A proceedings volume is in the planning stage.

CONTINENTAL RIFTS PROJECT

In all the complexities of the continents, there are two major groups of structural features: rifts and sutures. Rifts are structures in which the continental lithosphere has ruptured under extension at least in its upper layers, and if the extension continues, become the sites of continental separation with the formation of a new ocean. Sutures are the complementary features to rifts, and mark the sites where continental masses have joined, often with sustained compression, to form linear belts of fold mountains. Both rifts and sutures are of obvious importance to earth scientists in their efforts to understand the dynamics of the continents. These structures are also of great importance to economic geologists, however, as important mineral and geothermal resources are associated with both rifts and sutures, and rifts commonly evolve into or are associated with sedimentary basins, or passive continental margins, with associated hydrocarbon resources. Continental rifts have counterparts on other planets, where crustal extension appears to have occurred, although sutures are precluded by the apparent one-plate structure of these planets. Rifts are therefore important to planetary, terrestrial, and economic geologists.

Following an initiative from NASA Headquarters, the Lunar and Planetary Institute has been active in developing a project on the study of continental rifts. The first stage of this project is a review of the present state of knowledge of the geological development of rifts, and the various models that have been proposed to explain the genesis of rifts and their associated resources. An important part of this review process will be a topical conference on the *Processes of Planetary Rifting*, co-sponsored by the LPI, American Geophysical Union (AGU), NASA, and the National Science Foundation (NSF), to be held at the Christian Brothers Retreat House, St. Helena, California from December 3-5, 1981. The co-conveners of the conference are Dr. Brian H. Baker, Center for Volcanology, University of Oregon, formerly Director of the Kenya Geological Survey, and Dr. Paul Morgan, staff scientist at the LPI. Following the conference, on December 6, a review of the role of NASA in the study of continental rifts, will be held.

The Rift Conference will be similar to a Penrose (GSA) or Chapman (AGU) conference in format. The program includes six sessions, each lasting one-half day. The sessions are:

1. Speculation as to the origins and development of rifts
2. Constraints on rift evolution — setting
3. Constraints on rift evolution — geological development
4. Constraints on rift evolution — physics and chemistry of the lithosphere
5. Resources associated with rifting, and
6. Our state of ignorance and its remedy —debate.

Attendance will be limited to approximately 60 participants, and invitations have been extended to potential participants on the basis of the evaluations by the conference program committee of written applications to attend. A distinguished international group of rift experts are expected to attend the conference representing the industrial, academic and government sectors of the earth sciences. A volume of extended abstracts submitted to the conference will be published by the LPI at the time of the conference, and a special volume of *Tectonophysics* will be published in late 1982 containing contributions to the conference. The deadline for manuscripts for this volume is April 1, 1982.

A review article "Continental Rifting: Progress and Outlook", (Baker and Morgan) to stimulate interest in the conference, was published in *EOS:Transactions of the American Geophysical Union* 62, 585-586, 1981. A limited number of reprints of this article are available from the Library/Information Center at the LPI. Request LPI Contribution No. 448.

SCIENTISTS COMPARE LUNAR BRECCIAS AND SOILS TO METEORITES

A "Workshop on Comparisons between Lunar Breccias and Soils and Their Meteoritic Analogs" was held at the LPI on November 9-11, 1981. The workshop sessions addressed four major topics:

1. Petrology and chemical compositions
2. Ages and exposure histories
3. Cratering dynamics, and
4. Models for regolith evolution

The first two topics were covered on the first day of the workshop and the last two on the second day. The third day was devoted to summaries of the previous sessions and discussions of potential collaborative research. This workshop is one of a series in the Highlands Initiative project. Co-conveners of the workshop are G.J. Taylor, University of New Mexico and L. Wilkening, University of Arizona. An LPI Technical Report containing abstracts of the keynote talks, contributed abstracts, summaries of discussions, and a synthesis of ideas generated concerning future research is being prepared.

PLANS FOR THE 13th L&PSC

The 13th LUNAR AND PLANETARY SCIENCE CONFERENCE will be held at the Johnson Space Center, Houston TX, March 15-19, 1982, under the joint sponsorship of the Center and the Lunar and Planetary Institute. Co-chairmen of the Conference are Dr. Michael Duke, JSC, and Dr. Roger J. Phillips, LPI.

This conference continues to be the key annual conference in planetary science, bringing together scientists in the fields of petrology, geochemistry, geophysics, geology, and astronomy.

The conference will be structured along the same lines as last year. Abstracts are due at the LPI by 11 January 1982. Please contact the Publications Office (713/486-2161) for forms and instructions.

The opportunity will be afforded for special sessions. At present a session on the Apollo 16 results is planned. Those interested in arranging for a special session should contact Ms. Pam Jones, LPI, 713/486-2150, or one of the program committee chairmen.

Poster sessions will again be available as alternatives to oral presentations. Requests for space must be accompanied by informative abstracts and will be judged by the same criteria for allocation of space and time as for oral presentations.

The first mailing about the conference will be forthcoming soon. If you wish to be sure to receive this mailing, please contact the Projects Office, LPI. The February issue of this BULLETIN will contain the preliminary program of the conference.

SOLAR OPTICAL TELESCOPE INVESTIGATORS SELECTED

The NASA Office of Space Science has selected two scientific investigators to develop instruments to fly aboard the planned Solar Optical Telescope.

Selected as instrument investigators were Dr. Harold Zirin, California Institute of Technology, Pasadena, CA and Dr. Alan M. Title, Lockheed Palo Alto Research Laboratory, Palo Alto, CA.

Zirin proposes developing a photometric filtergraph which will be able to observe the Sun through various optical filters in the near infrared, visible and ultraviolet regions of the spectrum. The proposed instrument will be able to make several hundreds of images on film during the one-week mission of the Solar Optical Telescope.

Title's proposal is for a coordinated filtergraph and spectrograph which will include a tunable visible-light and optical filter system and a high resolution spectrograph with motion compensation. The spectrograph will operate in both the visible and ultraviolet spectral regions. Both the filtergraph and the spectrograph will record data using charge-coupled device imaging systems, and relay the information directly to the ground for examination by scientists.

These two instrument assemblies will be located at the focal point of a 1.25-meter (4-foot) diameter telescope. The telescope assembly will be mounted on a pointing system located within the Space Shuttle payload bay. The Solar Optical Telescope will be designed for a variety of solar physics investigations on several Spacelab flights.

Also selected along with the instrument investigators were seven investigators who will do studies of the Sun using data from the two instruments. They are: Dr. John Harvey, Kitt Peak National Observatory, Tucson, AZ; Dr. Jacques Beckers, Multiple Mirror Telescope, University of Arizona, Tucson, AZ; Dr. George Doschek, Naval Research Laboratory, Washington, DC; Dr. R. Grant Athay, High Altitude Observatory, Boulder, CO; Dr. Cornelis Zwaan, The Astronomical Institute, Utrecht, the Netherlands; Dr. Oran R. White, Mancos, CO; and Dr. Richard Fisher, High Altitude Observatory, Boulder, CO.

Now that selection of the instruments and investigators has been made, the next step is the negotiation of contracts between the scientists and the NASA Office of Space Science. The current timetable for the first flight of this instrument, which is expected to expand considerably on the unsurpassed results of the Skylab Apollo Telescope Mount, shows initial launch in the spring of 1987, with reflights scheduled thereafter.

Program scientist for the Solar Optical Telescope is Dr. Eric Chipman, NASA Headquarters; program manager for the telescope is Ronald Felice, also of NASA Headquarters.

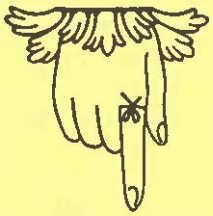
NASA Press Release 81-149, 9/18/81

SATURN CONFERENCE PLANNED

This is the announcement of a book and a conference entitled SATURN and a call for papers. The purpose is to study Saturn further and to bring together the results from recent space missions, earthbased observations, and theoretical studies. The conference is to be held in Tucson, Arizona May 18-22, 1982.

Abstracts are due by February 15, 1982. They will be circulated to all participants before the conference. The contributed papers will be published in a feature issue. The conference program will include presentations of invited papers, as well as contributed papers, poster talks and exhibits. Invited papers will be published as chapters in a major reference text book that may be published in the Space Science Series of the University of Arizona Press. The Saturn book will be edited by Tom Gehrels and Mildred Shapley Matthews.

For more information about this conference please contact Mildred Shapley Matthews, University of Arizona, Lunar and Planetary Laboratory, Tucson AZ 85721.



GILLAM NAMED SPECIAL ASSISTANT TO NASA ADMINISTRATOR

Isaac T. Gillam IV, Director of NASA's Dryden Flight Research Center, Edwards, CA, has been named Special Assistant to the Administrator of NASA. Gillam will be detailed to the White House Office of Science and Technology where he will participate in a Space Policy Review.

Gillam began his 18-year career at NASA Heaquarters in 1963 as a Resources Management Specialist. In 1966 he was appointed Assistant Program Manager for the Delta launch vehicle and in 1968 became Program Manager. He was involved with Delta and Scout launch vehicles and numerous international cooperative and reimbursable projects while Program Manager of Small Launch Vehicles and International Projects for NASA in 1973.

During the Space Shuttle Approach and Landing Tests in 1977, Gillam was Director of Shuttle Operations at Dryden. He was named Director of Dryden on June 7, 1978, after serving as Deputy Director.

Gillam received NASA's highest award, the Distinguished Service Medal, for his work on the NASA launch vehicle program.

He is an Associate Fellow of the American Institute of Aeronautics and Astronautics and a Fellow of the American Astronautical Society. He is also a member of the American Management Association, the National Defense Preparedness Association and the Air Force Association.

NASA Press release 81-151, 9/21/81

JSC GRANT AND FACILITIES SUPPORT OFFERED

The NASA/Johnson Space Center Planetary and Earth Sciences Division, Houston, TX, makes laboratory facilities available to visiting scientists as a part of its support for the planetary exploration program. The Division laboratories include a wide range of petrological experimental and analytical facilities, optical and IR spectrometers, planetary surface simulators, solid source and gas mass spectrometers, impact experiment facility, and space plasma simulation facilities.

Two special programs provide financial support for graduate and post-doctoral researchers. The NASA Graduate Student Researchers Program (GSRP) provides an opportunity for graduate students to pursue their thesis research at JSC. The National Research Council supports Resident Research Associateships (RRA) which allow post-doctoral scientists to conduct research on problems of their own choosing as long as they are compatible with JSC interests. The next closing dates for applications are January 15, 1982 for the RRA program and February 1, 1982 for GSRP. Further information can be obtained from Dr. M. B. Duke, Chief, Planetary and Earth Sciences Division, NASA/-Johnson Space Center, Houston, TX 77058.

WORK MOVES ALONG ON HARDWARE FOR GALILEO MISSION TO JUPITER

Components for the Galileo spacecraft, scheduled for launch in 1985 to Jupiter, are nearing completion, and the development model for the heat shield on the probe recently passed tests at the NASA Ames Research Center, Mountain View, CA.

Galileo is a two spacecraft — orbiter and entry probe — mission to extend our knowledge about Jupiter and its moons.

The probe heat shield is only one of hundreds of components which are either now undergoing tests or will soon begin their test phase. Program manager Ron McCullar says that approximately 95 percent of the flight parts have been delivered and the design for the two spacecraft and the mission are nearing completion.

Jupiter, the giant gas planet has been visited four times by survey spacecraft, by Pioneers 10 and 11 in 1973 and 1974 and the Voyagers 1 and 2 in 1979. Information from those missions has led to dramatic increases in our understanding of the evolution of the solar system. The Galileo mission will expand on these flybys with the first entry probe into Jupiter's atmosphere and an orbiting observatory which will provide long-term detailed studies of the entire Jupiter system.

The Ames-designed probe heat shield, being built by General Electric, will encase the Jupiter probe instruments with two pieces. The first, a conical shaped front shield made from a carbon cloth treated in plastic resin (carbon phenolic), will be 10 centimeters (4 inches) thick at the nose and up to 125 cm (50 in.) in diameter. The rear piece will be composed of a slightly different material, nylon phenolic, because this lower density material will save weight while providing adequate protection for the less severe afterbody heating environment.

The probe, when it plunges into Jupiter's atmosphere, will be going 48.2 kilometers per second (115,000 miles per hour), fast enough to get from New York to Los Angeles in ninety seconds. This entry speed will expose the probe to nearly seven times as much radiation as our Sun produces at its surface, 42 kilowatts per square cm (271 kilowatts per sq.in.).

Upon entry, aerodynamic braking by Jupiter's thick atmosphere will decelerate the probe with a force equal to 300 times the gravity of the Earth. During this extreme braking, the sacrificial front body shield will vaporize down to a mere centimeter (about one-half inch). The vaporization of the carbon phenolic material will provide a heat-absorbing blanket to protect the seven probe instruments until a parachute opens and yanks the remaining shields away. The probe then has about an hour to make measurements of Jupiter's atmosphere.

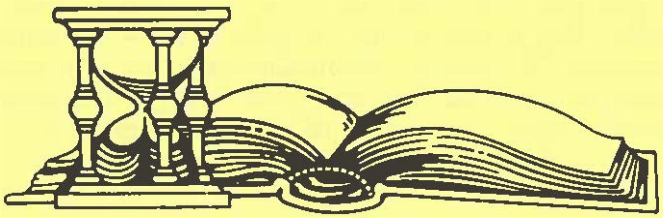
During the first 20 seconds of its entry, radiative and convective heating will bring the heat-absorbing gas layer around the probe to a searing 8,317 degrees Celsius (14,000 degrees Fahrenheit). Radiative energy is produced by the hydrogen molecules of Jupiter's atmosphere breaking apart and recombining. Convection heating is caused by the friction of gases heated and compressed by the probe's supersonic shock layer as it descends through Jupiter's upper cloud layers.

Carbon phenolic was chosen for the outer layer because it absorbs large amounts of energy in the process of vaporizing. Furthermore, this material has been used for heat shields on previous spaceflights, including the Pioneer Venus probes.

Theoretical investigations were carried out at the NASA's Ames Research Center and NASA Langley Research Center, Hampton, VA, to determine how the shield should be designed and evaluated. Experimental work was performed at Ames to characterize heat shield material performance. Haveg Industries, Santa Fe Springs, CA will build the shield under subcontract to General Electric.

Ames Research Center is the development and management center for the Galileo Probe. NASA's Jet Propulsion Laboratory, Pasadena, CA is providing project management for the Galileo mission for NASA's Office of Space Science. Galileo program manager is Ron McCullar, NASA Headquarters; acting program scientist is Dr. Geoffrey Briggs, also NASA Headquarters.

NASA Press release 81-143, 9-16-81



ANNOUNCEMENT: PLANETARY VOLATILES CONFERENCE, NOVEMBER '82

A Topical Conference on Planetary Volatiles to be held in November 1982 is in the planning stages. Co-conveners of the conference are R.O. Pepin, University of Minnesota, R. O'Connell, Harvard University, and F. Fanale, University of Hawaii.

The goal of the meeting is to deduce the inventories of volatiles through time in planetary interiors and atmospheres, and their role in the petrology, geochemistry and geophysics of differentiation and transport. The primary focus will be on Earth, and on Mars and Venus for comparative studies. Meteorite data are essential: they provide the best first-order estimates of the probable initial complement of volatile elements and compounds in the primary preplanetary matter from which the terrestrial planets accreted.

Major topics to be addressed will include:

1 Initial inventories of volatiles in protoplanetary and accreted planetary matter.
2 Accretional time-scales
3 Extent and importance of mantle and other possible volatile reservoirs through time
4 Experimental petrology of reactions in rock systems with volatile components
5 Isotopic evidence and constraints on source regions
6 Thermal evolution and volatile transport within planets
7 Transport mechanisms and fluxes through planetary surfaces
8 Reverse surface flux: trapping, storage and/or recycling of volatiles; geochemical cycles
9 Composition and chemical evolution of planetary atmospheres
10 Present-day partitioning of volatiles among mantle, crustal, and atmospheric reservoirs; extent and chronology of outgassing, and implications for thermal history

If you are interested in participating in this meeting, please contact Ms. Pam Jones, LPI, 713-486-2150. Attendance will be by invitation.

NEW PUBLICATIONS

NASA PUBLICATIONS

The following publications are available from the Superintendent of Documents, Government Printing Office, Washington DC 20402. Although this agency requires prepayment on all orders, they will accept Mastercard or VISA credit cards. Just include the account number and expiration date on your order to them. Some of the publications may be available from the GPO bookstores which are found in major cities around the U.S. Check your city directory for a local listing.

Several of the GPO publications are being offered by other distributors at widely varying prices. It pays to shop and compare.

PLEASE do not send orders for these publications to the LPI. We are not a distribution center for SOD documents and this will only delay your order.

Comet Halley Handbook; an Observer's Guide
Intended for serious amateur and professional astronomers, the "Observer's Guide" contains ephemeris data and other information to help you view the Comet Halley when it returns in 1986. 1981. 44 pages.
Order no. S/N 033-000-00818-0 $3.25

Project Galileo; a Return to Jupiter
Project Galileo, which is scheduled to launch in 1985, is the successor to the triumphant Voyager mission. Galileo will orbit close to Jupiter and the Galilean satellites and eventually send a probe down into the atmosphere of Jupiter. This attractive booklet introduces the next exciting step in our exploration of the solar system. 1980. 8 pages.
Order no. S/N 033-000-00815-5 $1.25

Origins of NASA Names
The names given to spaceflight projects and programs come from no single source or method. This book explains the naming of NASA's launch vehicles, satellites, probes, manned flights, rockets, and installations. Although published in 1976, this book will be of interest to space buffs and makes a handy reference tool. 227 pages.
Order no. S/N 033-000-00636-5 $3.65

High Energy Astronomy Observatory
Since the launch of the second High Energy Astronomy Observatory (HEAO), a steady stream of pictures of the universe in X-ray light has been returned to Earth. X-rays from astronomical bodies cannot be seen by ground-based scientists because Earth's atmosphere blocks them out.
High energy radiation is associated with some of the strangest objects in the sky: neutron stars, exploding galaxies, the remains of supernovae, pulsars, cosmic bursters, and black holes. This means that the HEAO sees a violent, turbulent universe still in evolution. It is a view that overturns age-old conceptions of the universe.
This attractive, full-color booklet provides a nontechnical overview of high energy astrophysics, a description of the remarkable HEAO 2 telescope, and explanations of the intriguing objects it focuses on. 1980. 36 pages.
Order no. S/N 033-000-00808-2 $2.50

Pioneer: First to Jupiter, Saturn, and Beyond
The Pioneer spacecraft have been true explorers; the first to navigate the asteroid belts, the first to encounter Jupiter and its fierce radiation belts, and Saturn and its rings. They will be the first manmade objects to leave our solar system. In so doing they have created a new enthusiasn and interest in our space program.
This handsome volume, written by R.O. Fimmel, J.Van Allen, and Eric Burgess, is NASA SP-446. It contains a comprehensive overview of the Pioneer mission. It includes numerous color photographs— many taken in space— and an easy-to-understand text, including analyses of data from the encounters with Jupiter, interplanetary results, and results from Pioneer 11's encounter with Saturn.
Earth-bound astronauts of all ages are sure to enjoy this new book from NASA. 1980. 285 pages.
S/N 033-000-00805-8 $13.00 clothbound

Voyage to Jupiter
Few missions of planetary exploration have provided such rewards of insight as the Voyager flybys of Jupiter. Never before had scientists been able to so closely inspect a planet that is a giant spinning sphere of hydrogen and helium. Never before had they been able to observe moons like Ganymede and Callisto, which are half water-ice. Never before had they been so close to a moon-size object dispersing sodium into space and generating a one-million-ampere electrical current.
This colorfully illustrated, non-technical publication describes the Voyager mission and the spectacular Jovian system the Voyager flybys unveiled, explaining the significance of the many discoveries that were made. The two encounters with Jupiter are related on an hour-by-hour basis and accompanied by the color illustrations that the spacecraft were transmitting continuously. Then, based on our new knowledge, Jupiter's origin, composition, and structure are explained. A separate chapter reveals the diverse and fascinating worlds that were discovered when Voyager examined the four Galilean satellites. NASA SP-439. 1980. 199 pages.
Order no. S/N 033-000-00797-3 $7.50

POSTERS — POSTERS — POSTERS —

There are three sets of posters available from the GPO which are very adaptable for displays. These include:

Voyager's Encounter with Jupiter and its Moons
Six posters provide a glimpse of how Voyager viewed the world of Jupiter. Each full-color 24x36" poster is printed on glossy paper. Images depicted include Jupiter's red spot, an intense volcanic eruption on the surface of Io and various views of four of Jupiter's moons: Europa, Ganymede, Io and Callisto. S/N 033-000-00791-4. $9.00

Voyager at Saturn Five posters showing results of Voyager 1 at Saturn. Views depicted include the rings of Saturn, collage of the satellites, several views of Titan, full disk Saturn showing ring structure. All posters are full color, 24 x 36", glossy paper. S/N 033-000-00831-7 $7.00

Going to Work in Space Three posters of the first launch of Space Shuttle Columbia. Again the posters are full color, 24 x 36", glossy paper prints depicted the launch, Columbia at the pad, and Columbia in flight. S/N 033-000-00824-4 $6.00

OTHER PUBLICATIONS OF INTEREST

REMEMBER. . . please do not order any of the publications listed here from the LPI. Contact the source, publisher, or your local book seller to obtain a copy.

Geology of the Apollo 16 area, central lunar highlands.
This volume contains the final results compiled by the Apollo Field Geology Investigations Team for the Apollo 16 mission. The purpose of the volume is to summarize the field observations at the Apollo 16 site and to bring together the various interpretations placed upon these observations by the astronauts and the Field Geology Team. Much of the extensive geochemical and geophysical data published since 1974 on the Apollo 16 site has not been incorporated. The intent is not to provide a grand synthesis but rather to document the local and regional geologic relations and to summarize what inferences can be made from them. (From the preface)

This volume edited by G.E. Ulrich, C.A. Hodges, and W.E. Muehlberger, is published as U.S.G.S. Professional Paper 1048. In addition to 539 pages of text, there are two sheets of microfiche data, and 12 folded maps. It may be purchased for $12.00 from either the Government Printing Office, Washington DC 20402, or from the Publications Distribution Office, U.S. Geological Survey, Reston VA 22092.

Bound for the Stars
"The future of the American people lies in space. In order to use and explore space, we must vastly expand our scientific and technological capabilities. Future benefits, such as inexhaustible fusion power, energy independence, and the end of air and water pollution, could revolutionize American society."
So say the authors of this new book, Saul J. Adelman and Benjamin Adelman. Inside you will find an amazing proposal to transform the frigid, almost airless planet Mars into a life-sustaining Earth-type planet. "We have reviewed the status and potential of the space enterprise. The exploration and colonization of the solar system will be highly rewarding and the possibility of interstellar exploration looks promising. The future of the space enterprise, however, depends as much upon popular support as upon the achievements of the scientists, engineers, and technicians." (From the book jacket).
This book about space travel in our solar system and beyond makes interesting reading to anyone intrigued by the concept of man's ventures into space. It presents a plausible 50 year plan for the accomplishment of the task of exploring and using our solar system.
The book is published by Prentice-Hall Inc., Englewood Cliffs, NJ 07632 and is available from the publisher or any local book-seller. 335 pages, $17.95 hard cover; $8.95 paperback.

New Earths: Restructuring Earth and Other Planets
Where "Bound for the Stars" emphasizes the engineering aspects of the vehicles needed for man's exploration and colonization of the solar system, James Oberg's new book discusses the planetary engineering which would be needed to transform the surface of another planet into a suitable habitat for man. Oberg talks about genetic engineering, climate modification, nuclear and solar energy, as just some of the methods available today that lend themselves to the major engineering feats.
Not only does the author discuss the technological aspects of terraforming, but he also considers the various objections to this

undertaking in the chapter "By What Right?" Mars, Venus, the Earth's Moon, and the four moons of Jupiter are examined individually in relation to what we know about their present atmospheric surface conditions, and what possibilities exist, and will exist for their future. Earth as well is considered a prime candidate for planetary modeling in order to increase fresh water supplies, relieve flooding, prevent drought, and offset the forecasted ice age. Actually, humankind has been busily engaged in modifying his environment for thousands of years. (From the dust jacket)

In these troubled times for space exploration programs, these two books offer plans for the future that peak the imagination of the reader and encourage us who are bound to the earth to "press on."

Published by Stackpole Books, P.O. Box 1831, Harrisburg, PA 17105. Available from the publisher or your local book-seller for $16.95 hard cover.

Remote Sensing 35 mm Slide Sets and Guides

There has been a long-standing need for a comprehensive set of slides to illustrate the various aspects of remote sensing. During 15 years of research and teaching in remote sensing, Floyd Sabins has acquired an extensive collection of slides. Examples were chosen from this collection to illustrate concepts and applications of remote sensing. Printed "Guides" were prepared that describe the slides.

The slides are grouped into 10 sets. The first set illustrates the interpretation projects and solutions for the "Remote Sensing Laboratory Manual" and the accompanying "Instructor's Key" by Sabins (1981) which are distributed by Remote Sensing Enterprises. The remaining slide sets are organized to follow the chapters in the textbook, *Remote Sensing—Principles and Interpretation* by Sabins (1978). With a few exceptions, the slides are *not* duplicates of figures from the book. The slide sets supplement the book figures and may be used independently of the book. Each slide set is accompanied by a "guide" that describes the significant aspects of each slide, together with references to related publications, where appropriate.

The slides are available in separate sets to enable purchasers to obtain material in their specific areas of interest. Those wishing additional information may purchase the complete "guide" for $4.90 (plus 6% sales tax in California). The guide lists and describes each slide. The price of the "Guide" will be credited against a slide order placed in the future.

The Slide sets and prices are as follows:

Remote sensing lab manual, instructor's key, 100 slides $125

Fundamental considerations; aerial photography, 35 slides $44

Manned satellite imagery; landsat imagery, 60 slides $75

Thermal infrared imagery, 49 slides $61

Radar imagery, 50 slides $62

Digital image processing, 43 slides $54

Resource exploration, 59 slides $74

Environmental and land-use applications, 55 slides $69

Natural hazards, 30 slides $38

Comparison of image types, 30 slides $38

California mailing addresses add 6% sales tax

Orders or requests for more information should be sent to: Remote Sensing Enterprises, P.O. Box 2893, La Habra, CA 90631

Space Shuttle-1981; a bibliographic guide

An interesting bibliography of popular articles relating to the development and first flight of "Columbia" has been prepared by M. Virginia Jackson at University of Alabama. Ms. Jackson includes a brief history of the space shuttle project and then proceeds to list ways in which the reader may locate additional information through library research. Several references to actual articles which have occurred in popular publications easily obtainable in most school or public libraries are also included.

To order the bibliography enclose $1.00 and mail to Ms. M. Virginia Jackson, c/o Reference Department, Mervyn H. Sterne Library, University of Alabama, Birmingham AL 35294.

VOYAGER 2/SATURN SLIDE SET

A set of 69 slides complete with descriptive guide is available from the Planetary Image Center, LPI, for $24.00 (add $5.00 per set for overseas airmail). The set

includes most of the photography which has been released from this spectacular encounter with Saturn and its satellites. The slides include both color and black/white views of the unusual findings in the ring structures, atmospheric formations, and surface features of the satellites. The descriptions in the guide are taken from those released from the Jet Propulsion Laboratory.

For information about the availability and new price information of other slide sets, contact PIC at the LPI (713-486-2172).

SPECIAL PUBLICATION ANNOUNCEMENT

The long awaited definitive text of *Basaltic Volcanism on the Terrestrial Planets* has been published by Pergamon Press Inc. This text, the result of the Basaltic Volcanism Study Project, administered by the Lunar and Planetary Institute, constitutes a nearly exhaustive framework for scholarly pursuit of the topic that appears to be the most accessible of the major processes in planetary thermal and chemical evolution. It contains comprehensive summaries of the state of knowledge in each research area: petrology, chemistry, remote sensing, geophysical and cosmochemical constraints, morphology, tectonics, isotope studies, and thermal histories. In addition, new descriptive and analytical data for the reference suites on a microfiche appendix presents one of the most comprehensive data bases available.

The book contains 1286 8-1/2 by 11 pages with line drawings, halftones, color plates, and an extensive index. The book will be available from Pergamon Press, Maxwell House, Fairview Park, Elmsford NY 10523 for $60.00. HOWEVER, as a special offer to readers of this BULLETIN an introductory price of $40.00 will be honored to anyone ordering the volume prior to January 1, 1982 using the special form published in this BULLETIN. REMEMBER, order from Pergamon, enclose your check, and the form from this BULLETIN, to obtain this special price.

Life's Trolley Ride

For a change of pace from the printed word, "Life's Trolley Ride" is a Folk-Legacy Records, Inc. LP record. The face on the dust cover will be familiar to many attendees of the annual conference and those fortunate enough to attend some of the real-time mission activities at JPL, the Cape, and JSC. It is indeed, Jonathan Eberhart, *Science News* writer in a different role as folk singer, guitarist, composer. Enthusiasts of folk music in Washington DC have long been familiar with Jon's music but it takes this record to acquaint others of us with his work. For the space enthusiast, the last feature of this album will be most appealing. "Lament for a Red Planet" was written in 1976 during the Viking missions. It is not about the spacecraft, or any other gadgetry. It invokes no imaginary Martians, nor is it concerned with any Earthling's gee-whiz reactions to being on another world, but it is a lyrical description of that planet based on the science described by the Vikings.

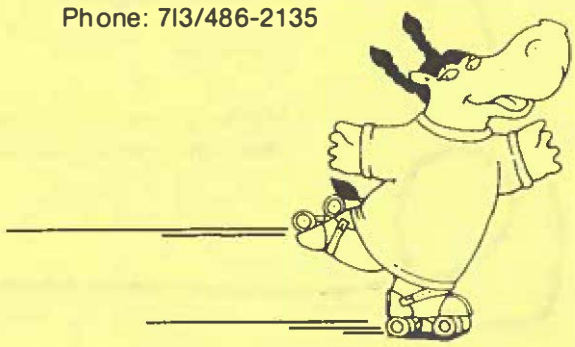
The LP record is available from Folk-Legacy Records, Inc., Sharon, CT 06069 $7.98 plus $1.00 postage in U.S.

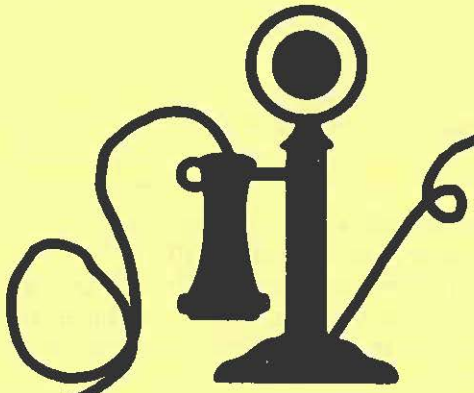
The *LUNAR AND PLANETARY INFORMATION BULLETIN* is published by the Lunar and Planetary Institute. There are usually four issues per year. It is distributed free on request to lunar and planetary scientists, educators, students, and their institutions.

The next issue will be in February. Copy deadline is January 11, 1982. If you have any announcements which you would like to have printed in the *BULLETIN*, please send them to the Editor. We reserve the right to select and edit copy.

EDITOR'S NOTE: Because of various mission schedules and budget constraints, this is a combined issue of the LUNAR AND PLANETARY INFORMATION BULLETIN. The next issue will be published and distributed in February. It will contain the preliminary program for the XIII Lunar and Planetary Science Conference as well as the usual complement of news and regular columns.

Editor: Frances B. Waranius,
Lunar and Planetary Institute
3303 NASA Road One, Houston, TX 77058
Phone: 713/486-2135





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NOTE: Using the old FTS number 525-3436 rings at an extension phone in the lobby of the Institute. In most instances your call will NOT be answered. PLEASE use the proper extension numbers with your FTS access code, and area code 713/486-XXXX.

Accounting	2140
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Graphics	2175
Information	2139
Library/Information Center	2135
Mailing List	2192
Maintenance	2171
Planetary Image Center	2172
Projects Office (Workshops, Conferences)	2150
Publications	2143
Review Panels	2151
After Hours/Weekends	2130

Scientists at the Institute, Summer 1981

Ashwal, L.	2147
Croft, S.	2146
Francis, P.	2167
Garihan, A.	2196
Golombek, M.	2194
Merrill, R.	2166
Morgan, P.	2193
Phillips, R.	2180
Reimold, W.	483-5579
Schultz, P.	2174
Sevier, J.	2170
Wadge, G.	2187
Wendlandt, R.	2153

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Please do use the individual extension numbers. It will save you time in the long run.

December 3-5

LPI Topical Conference: Processes of Planetary Rifting, Christian Brothers' Retreat House, Napa Valley, CA
Contact: Rift Meeting
Lunar and Planetary Institute
3303 NASA Road One
Houston TX 77058
Tel: 713/486-2150

December 7-11

American Geophysical Union Fall Meeting, San Francisco CA
Contact: American Geophysical Union Headquarters
2000 Florida Avenue NW
Washington DC 20009

1982

January 11

DEADLINE Abstracts for XIII Lunar & Planetary Science Conference
Contact: Publications Office
LPI
Telephone: 713/486-2161

January 27-29

First Annual Conference on the Management, Analysis and Display of Geoscience Data, Colorado School of Mines, Golden, Colorado
Contact: Richard B. McCammon
U.S. Geological Survey
National Center 920
Reston VA 22092

February 15

DEADLINE Abstracts for Saturn Conference
Contact: M. S. Matthews
University of Arizona
Lunar and Planetary Laboratory
Tucson AZ 85721

February 19-20

Seventh Symposium on Antarctic Meteorites, National Institute of Polar Research, Tokyo, Japan
Contact: Dr. Takesi Nagata, Director
National Institute of Polar Research
9-10 Kaga I-Chome
Itabashi-Ku
Tokyo 173 Japan

MARCH 15-19	XIII LUNAR AND PLANETARY SCIENCE CONFERENCE Houston, Texas Contact: Projects Office Lunar and Planetary Institute 3303 NASA Road One Houston TX 77058 Telephone: 713/486-2150
April 1	*DEADLINE* Manuscripts for Contintental Rift Workshop Proceedings Papers Contact: Publications Office LPI Telephone: 713/486-2161
May 17-June 3	24th Plenary Meeting of COSPAR, Ottawa, Ontario, Canada Contact: T.W. McGrath, Executive Member, Local Organizing Committee XXIV COSPAR Conference Secretariat National Research Council Ottawa, Ontario K1A OR6, Canada
May 18-22	Saturn Conference, Tucson, Arizona Contact: M. S. Shapley University of Arizona Lunar and Planetary Laboratory Tucson AZ 85721
May 31-June 4	American Geophysical Union Spring Meeting, Philadelphia, Pennsylvania Contact: American Geophysical Union 2000 Florida Avenue NW Washington DC 20009
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
September 8-11	Third International Kimberlite Conference Clermont-Ferrand, France Contact: Dr. C. J. Allegre University of Paris 6-7 2, Jussieu 75 Paris 5 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

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THE MOON AND THE PLANETS VOL. 24, 453-463 (1981)

OTHER OBJECTS. METEORITES

BALDWIN,R.B. (OLIVER MACHINERY CO., GRAND RAPIDS, MI 49504): TEKTITES: SIZE ESTIMATES OF THEIR SOURCE CRATERS AND IMPLICATIONS FOR THEIR ORIGIN
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METEORITICS VOL. 16, 185-191 (1981)

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METEORITICS VOL. 16, 61-68 (1981)

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METEORITICS VOL. 16, 171-184 (1981)

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NATURE VOL. 291, 396-398 (1981)

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METEORITICS VOL. 16, 115-128 (1981)

OTHER OBJECTS. METEORITES (Continued)

DODD,R.T. + JAROSEWICH,E. (DEPT. OF EARTH AND SPACE SCIENCES, STATE UNIV. OF NEW YORK AT STONY BROOK, NY 11794): CHEMICAL VARIATIONS AMONG L-GROUP CHONDRITES. III. MAJOR ELEMENT VARIATION IN L6 CHONDRITES
METEORITICS VOL. 16, 93-111 (1981)

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METEORITICS VOL. 16, 77-81 (1981)

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METEORITICS VOL. 16, 129-137 (1981)

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METEORITICS VOL. 16, 17-43 (1981)

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METEORITICS VOL. 16, 141-152 (1981)

OTHER OBJECTS, METEORITES (Continued)

OLSEN,E. (DEPT. OF GEOLOGY, FIELD MUSEUM OF NATURAL HISTORY, CHICAGO, IL 60605): VUGS IN ORDINARY CHONDRITES
METEORITICS VOL. 16, 45-59 (1981)

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TABLE OF CONTENTS

Voyager 2/Saturn pictures	Page 1
Mars people meet in Pasadena	Page 6
ECG project meeting	Page 7
Workshop on magmatic processes	Page 7
Venus environment meeting	Page 8
Impacts conference	Page 8
Continental rifts project	Page 9
Lunar breccias and soils compared to meteorites	Page 9
XIII LUNAR AND PLANETARY SCIENCE CONFERENCE	Page 10
Solar Optical Telescope PI's	Page 10
Saturn conference planned	Page 11
JSC grant and facilities support	Page 11
Galileo mission hardware	Page 12
Planetary volatiles conference	Page 13
New Publications, NASA et al.	Page 13
LPI Telephone Directory *Save for future reference*	Page 18
Calendar	Page 19
Lunar and Planetary Bibliography	Page 21
Order form - LPI materials	Page 32
Order form - BASALTIC VOLCANISM volume	Page 33

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