

LUNAR AND PLANETARY



# INFORMATION BULLETIN

MAY 1988 • NUMBER 50

## 19th Lunar and Planetary Science Conference

A record 739 scientists from 19 countries attended the 19th Lunar and Planetary Science Conference in Houston, March 13-18. Conference sponsors were the Lunar and Planetary Institute, NASA Johnson Space Center, the American Association of Petroleum Geologists, the American Geophysical Union, the Division for Planetary Sciences of the American Astronomical Society, the Geological Society of America, the International Union of Geological Sciences, and the Meteoritical Society.

The conference program was prepared on the basis of the 700 submitted abstracts. The Program Committee consisted of cochairmen Kevin Burke, LPI; Michael Duke and William Phinney, NASA/JSC. Committee members included Calvin Alexander, University of Minnesota; Abhijit Basu, Indiana University; Mark Cintala, NASA/JSC; James Garvin, NASA/Goddard; Richard Grieve, Geological Survey of Canada; Ray Hawke, University of Hawaii; John Jones, NASA/JSC; Marilyn Lindstrom, NASA/JSC; Sidney Niemeyer, Livermore National Laboratory; Robert Reedy, Los Alamos National Laboratory; Alan Rubin, UCLA; Graham Ryder, LPI; Stephen Saunders, JPL; Virgil Sharpton, LPI; Peter Thomas, Cornell University; Thomas Watters, National Air & Space Museum; Charles Wood, NASA/JSC; James Zimbelman, LPI; and Michael Zolensky, NASA/JSC.

Three concurrent sessions were conducted each morning and afternoon of the four and one-half day conference. A public session organized by NASA/JSC and NASA Headquarters on Exploration Initiatives was held Monday evening in the JSC Building 2 Auditorium. On Tuesday evening a special session organized by Calvin Alexander and entitled *Noble Gases and Solar System History* was held in honor of John Reynolds' 65th birthday. At the conference forum held on Thursday during the lunch hour, plans for special events to



Bevan French of NASA Headquarters presents a plaque commemorating the American discovery of the martian moon Phobos to Lev Mukhin of the Soviet Space Research Institute. (Story page 3)

mark the event of the 20th LPSC were discussed. Suggestions for special sessions or events and memorabilia for an exhibit were requested by the organizers.

One major topic of this year's conference was the Earth, as scientists continued in their efforts to understand what caused mass extinctions 65 million years ago. John D. O'Keefe and Thomas Ahrens of Caltech reported on their hypothesis that the large quantities of carbon dioxide released into the atmosphere by a large impact trapped the sun's heat and *raised* Earth's temperatures. This greenhouse effect contradicts earlier impact theories that Earth's temperatures lowered as a result of the blockage of sunlight.

James W. Head and Lawrence S. Crumpler reported on radar observations of Venus showing cross-strike discontinuities they believe to be similar to tectonic

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Michael Duke, New Initiatives special session chairman, with featured speakers Lennard Fisk and John Aaron. From left: Lennard Fisk, NASA Associate Administrator for Space Science and Applications; John Aaron, NASA Assistant Administrator for the Office of Exploration; and Michael Duke, Chief of the Solar System Exploration Division, NASA/JSC.

processes on Earth. According to Head, the significance of this lies in being able to interpret what is happening on Venus rather than in the conclusion that it may fit "a terrestrial stereotype."

Other topics included in the program were the geology and remote sensing of Mars, water and ice on Mars, exploration of Mars and Phobos, cosmic dust, carbonaceous chondrites, geologic and remote sensing studies of the Moon, asteroids and comets, impact flux and terrestrial cratering, and studies of lunar samples and meteorites.

The launch of the Soviet mission to Phobos this summer, as well as the anticipated launch of the Magellan (the Venus radar mapper) in April 1989 and the Voyager 2 Neptune flyby on August 24, 1989, will provide important data for future conferences.

### Abstract Deadline for LPSC XX

The deadline for abstracts for the Twentieth Lunar and Planetary Science Conference is **January 18, 1989**.

Please mail early. We cannot control inadequate postal services, the effects of winter storms, or federal holidays during Christmas and January. What we can control is the amount of time needed to prepare these abstracts for review by the Program Committee and for publication in the conference volume.

If you have any questions, call Stephanie Tindell, Managing Editor, Lunar and Planetary Institute, at 713-486-2143 or by electronic mail via NASA/SPAN LPI:TINDELL.



Two unique scientists take time out from the hectic schedule. From left: Sean Solomon, MIT, and Gerald Wasserburg, Caltech.



Scientist is assisted at the LPI Display by Stephen Tellier of the LPI Library Information Center.



## Soviet Phobos Mission to Carry U.S. Plaque

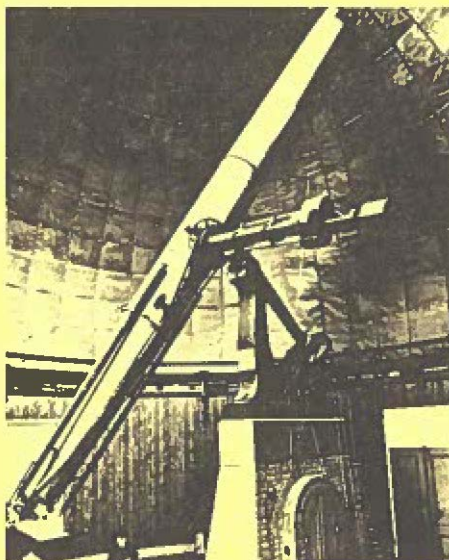
The Soviet Space Research Institute and the Soviet government have agreed to place a plaque commemorating the discovery of Phobos aboard the spacecraft destined for the martian moon. The Soviet Phobos mission, due to launch in July 1988, is expected to reach its destination in the spring of 1989.

The two moons of Mars, Phobos and Deimos, were discovered in August 1877 by astronomer Asaph Hall of the U.S. Naval Observatory, Washington, DC, using a 26-inch refracting telescope. The plaque consists of a photographic transfer on aluminum of Hall's telescope logbook page for the date August 17, 1877. Dr. Bevan French of the NASA Headquarters Solar System Exploration Division presented the plaque to Dr. Lev Mukhin of the Soviet Space Research Institute during the 19th LPSC in March.

Asaph Hall's great-great grandson, Andrew Hyde, learned of the Soviet mission to the martian satellite last year and proposed this action to NASA's Solar System Exploration Office. A subsequent request to the Soviet Academy of Sciences brought a favorable response. Hyde, who currently works on the staff of Virginia Senator John Warner, is delighted. "This is something my great-great grandfather in his wildest imagination never could have imagined. He would be very proud," Hyde remarked.

Since 1877 the U.S. Naval Observatory has continued to observe Mars, Phobos, and Deimos with the same telescope that Asaph Hall used to discover the satellites. The Soviet Phobos mission will use satellite ephemerides based on U.S. Naval Observatory observations dating back over the past 100 years.

In addition to reproducing the original Hall notations, the plaque carries the following two citations, both in English and Russian: "USSR Phobos Mission 1988" and "Discovery of Phobos - Asaph Hall - U.S. Naval Observatory - August 17, 1877."



The telescope used by Asaph Hall when he discovered Phobos in August 1877 is still in use at the U.S. Naval Observatory in Washington, DC.

## MECA-LPI Workshop: Dust on Mars III

*Dust on Mars III* will be held on September 21-23, 1988, in Estes Park, Colorado. The goal of the workshop is to stimulate cooperative research on, and discussion of, dust-related processes on Mars; this should provide valuable background information and help in preparation and scientific planning for the Mars Observer mission. The workshop will address the following general questions:

- How is dust ejected from the martian surface into the atmosphere?
- How does the global atmospheric circulation affect the redistribution of dust on Mars?
- Are there sources and sinks of dust on Mars? If so, where are they and how do they vary with time?
- How many components of dust are there on Mars, and what are their properties?

For information call Becky Turner, LPI Projects Office, at 713-486-2158, or Steven Lee, Workshop Organizer, at 303-492-5348.

## 51st Annual Meeting of Meteoritical Society

The 51st Annual Meeting of the Meteoritical Society will be held July 18-22, 1988, in Fayetteville, Arkansas. General and topical sessions will be held dealing with new results from meteorite, lunar, and planetary research. The scientific sessions will take place from July 18 with morning sessions only on July 21 and 22.

Two field trips led by the Geology Department, University of Arkansas, and the Arkansas Geological Survey are planned. One will concentrate on shelf-basin sections of the Ozark and Ouchita Mountains, the other will visit the diamond fields and Ouchita ore deposits. Also planned are at least four full- or half-day excursions, three before the meeting (Buffalo River float trip, Ozark Mountain hiking, and Mrs. Wasson's farmhouse and creek) and one after (Passion Play at Eureka Springs). Over 280 delegates and approximately 80 guests are expected to attend.

For more information, contact Derek Sears, University of Arkansas, at 501-575-5204.

## Special Impact Session at Fall '88 AGU Meeting

The surfaces of Mars, the Moon, and Mercury are riddled with impact scars ranging from subkilometer scales to massive basins over 1000 km across. The strong control exerted over subsequent geological evolution of these planets by such impacts, therefore, is undeniable. For Earth, however, with its regime of intense surface processes, the surface expression of extraterrestrial impacts is quickly obscured. There are less than 120 impact craters recognized to date, and because many of these are severely degraded, their impact origin is not universally accepted. Discovery of geochemical and physical evidence of a major accretionary event at the K-T boundary has broadened awareness of the potential of impact events for altering the course of biological and geological evolution on Earth and has heightened curiosity about the geological record of terrestrial impact craters.

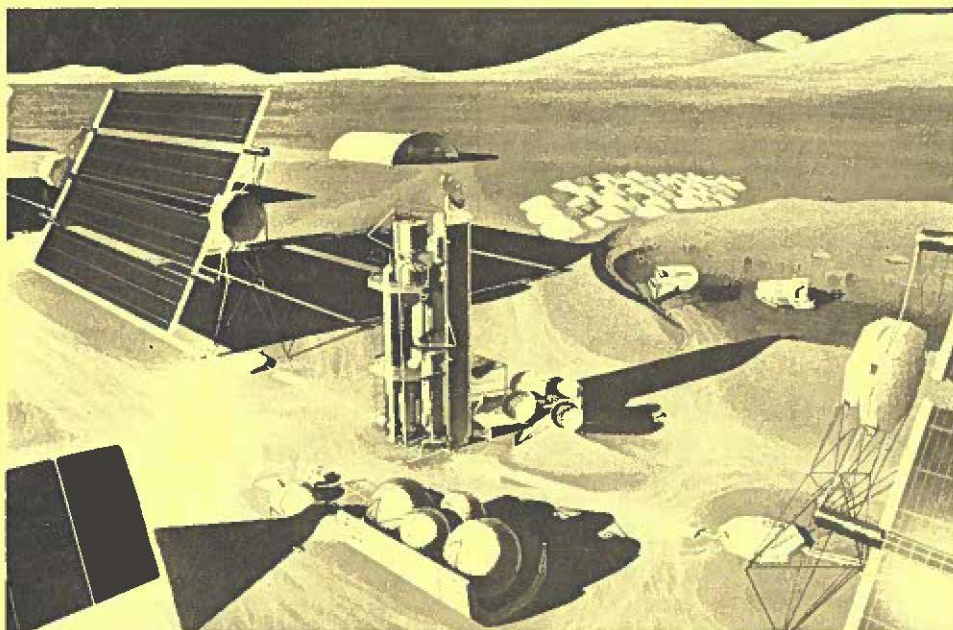
A special session on *Recent Refinements in the Terrestrial Impact Record* is being organized for the Fall AGU Meeting (San Francisco, December 5-9), cosponsored by the Planetology Section and the Lunar and Planetary Institute. A mix of invited and contributed papers will be presented. This session will offer the opportunity of presenting before a general geological audience advances in discriminating impact from other geological processes and recent studies of terrestrial impact structures. Relevant topics of research could include:

- Spaceborne studies of terrestrial impact structures
- Insights from planetary studies
- Morphological and structural studies
- Microscopic studies
- Age refinements and projectile identification
- Implications of tektites, glasses, and ejecta distributions for source craters

Anyone interested in contributing a paper should submit an abstract in standard AGU format before September 7, 1988, to Buck Sharpton, Lunar and Planetary Institute, 3303 NASA Road One, Houston TX 77058-4399. In addition, the original abstract and two copies must be sent to AGU Meetings, 2000 Florida Avenue, NW, Washington, DC 20009 by September 7, 1988.

For additional information please contact the special session organizer, Buck Sharpton at 713-486-2111.





Conceptual design of a lunar oxygen pilot plant is representative of research presented at the 2nd Symposium on Lunar Bases and Space Activities of the 21st Century, April 5-7, in Houston. (Principal Investigator Eric Christiansen, engineering painter Mark Dowman.)

## 2nd Symposium

# Lunar Bases and Space Activities

The Second Symposium on Lunar Bases and Space Activities of the 21st Century was held April 5-7, 1988, at the Westin Galleria Hotel in Houston, Texas. Approximately 550 attendees heard more than 200 papers delivered on subjects ranging from engineering analyses of space transportation networks and planetary surface outposts to legal, sociological, and public policy discussions related to space program initiatives over the next few decades. Scientists proposed experiments suited for a manned lunar space base; designers suggested architectural concepts and construction techniques for planetary surface habitats; and bioengineers reviewed the essential elements of biologically based, regenerative life support systems.

Participation was double that of the first lunar base symposium held at the National Academy of Sciences in Washington, DC, in 1984. Attendees and presenters included many participants from NASA Headquarters and the NASA field centers. This symposium was the first large meeting to focus on the theme of human exploration of the solar system as it is being developed in NASA's new Office of Exploration.

Featured speakers included Dale Myers, NASA Deputy Administrator; John Aaron, NASA Assistant Administrator for Exploration; Aaron Cohen, Director of the

NASA-Johnson Space Center; Hans Mark, former NASA Deputy Administrator; and Harrison Schmitt, Apollo astronaut and former U.S. senator. Attendees came from 34 states and the District of Columbia, as well as several foreign countries. A session on International Questions was chaired by Dr. Herman Koelle of the Technical University of Berlin, who heads up an International Lunar Base Committee within the International Academy of Astronautics. The featured luncheon speaker was Dr. V. V. Shevchenko of the Sternberg Astronomical Institute at the University of Moscow, who reflected on considerations for site selection for a lunar base.

The symposium was cosponsored by NASA Johnson Space Center, the American Institute of Aeronautics and Astronautics, the Lunar and Planetary Institute, the American Geophysical Union, the American Nuclear Society, the Space Studies Institute, and the National Space Society. Copies of the abstract volume containing summaries of 250 papers are available from the Lunar and Planetary Institute for a small shipping and handling charge. A peer-reviewed technical volume based on the papers at the conference will be published next year.

—Wendell Mendell

## LPI Summer Intern Program

The 1988 Summer Intern Program will soon be underway at the Lunar and Planetary Institute. The program is designed to acquaint undergraduates or recent graduates to the world of research. Each intern will have a project directed by a scientist-advisor from the LPI or the NASA Johnson Space Center. During the ten-week period, the interns will have the opportunity to attend lectures and seminars given by various scientists in space science programs. At the end of the period, there will be a mini-conference at which each of the interns will present the results of the research he or she has conducted during the summer.

The program, now in its twelfth year, attracted approximately 100 applicants, 13 of whom were selected to participate. The LPI scientific organizers were Dr. Nadine Barlow and Dr. Bruce Bills.

This year's interns, their advisors, and projects are as follows:

**NATHAN BRIDGES**, University of Colorado, Boulder

**ADVISOR:** Dr. Nadine G. Barlow, Lunar and Planetary Institute

**PROJECT:** *Rampart morphology of martian impact craters.* The focus will be to determine the degree of lobateness exhibited by 3244 of the 42,283 cataloged impact craters on the martian surface.

**DOUGLAS TURNER COLLINS**, University of Houston

**ADVISOR:** Dr. Arch Reid, Lunar and Planetary Institute

**PROJECT:** *Pleonaste spinels in Apollo 14 breccias.* The major objective is to decipher the nature and petrogenesis of the source rocks from which the pleonaste spinels are derived.

**JANET M. FEHRINGER**, Michigan Technological University

**ADVISOR:** Dr. Steven Williams, Lunar and Planetary Institute

**PROJECT:** *Physical properties of martian surface materials: slumps at Ascræus Mons.* The Viking data set will be examined, and geologic and engineering literature on slope failure will be researched; in addition, the digital images of Ascræus Mons will be examined.

**MARK L. HOUDASHELT**, Colorado State University

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

**PROJECT:** *Hydrogen in lunar soils.* Grain size separates will be analyzed to document hydrogen distribution in different lunar materials. Results will be used to



determine if sufficient hydrogen is present in the lunar regolith for recovery in support of a possible lunar base.

**THERESA L. HOYT**, California State University, San Francisco

**ADVISOR:** Dr. Michael Zolensky, NASA Johnson Space Center

**PROJECT:** *Search for interplanetary dust and interstellar dust grains in old Antarctic ice.* The mineralogy and composition of those grains will be determined, and the results used to refine models of early solar nebula.

**SUSAN ELIZABETH HUBBARD**, Whitman College

**ADVISOR:** Dr. Bruce Bills, Lunar and Planetary Institute

**PROJECT:** *Paleolake shorelines in Nevada and Bolivia.* It will use aerial photographs and Landsat images to delineate the shorelines of Lake Minchin in Bolivia, Peru, and Argentina and several of the smaller lakes immediately to the west of Lake Bonneville in Utah, Nevada, and Idaho.

**PHILIP E. JANNEY**, University of New Hampshire

**ADVISOR:** Dr. John Jones, NASA Johnson Space Center

**PROJECT:** *Core formation processes in*

*the terrestrial planets.* Models for trace element partitioning in metallic systems will be used to glean information on core formation. Elements of immediate interest for partitioning studies are Ni, Ge, and P.

**CELESTE D. MAAG**, Louisiana State University

**ADVISOR:** Dr. Lewis Ashwal and Dr. A. V. Murali, Lunar and Planetary Institute

**PROJECT:** *Heavy rare earth elements in garnets.* An investigation will seek to determine whether all garnets show affinity for these elements.

**BILLY EDGAR MOSS**, Auburn University

**ADVISOR:** Marilyn Lindstrom, NASA Johnson Space Center

**PROJECT:** *KREEP and mare basalts from Apollo 15 breccia 15205.* The work will involve analyses of 20-30 samples by INAA for trace elements and fused-bead microprobe analysis for major elements.

**TRACY K. PORTER**, Brown University

**ADVISOR:** Dr. Peter Francis and Dr. Shan de Silva, Lunar and Planetary Institute

**PROJECT:** *New catalog of the active volcanoes in the Central Andes.* TM images will be supplemented by field data. Among aspects involved in the project are remote sensing, image processing, and volcanology.

**SARAH BEAN SHERMAN**, Boston University

**ADVISOR:** Dr. Graham Ryder, Lunar and Planetary Institute

**PROJECT:** *A compendium of 4-10mm rock fragments from the Apollo 15 landing site.* The intern will gain knowledge of lunar geology, rock types, and geochemistry as well as the study of extraterrestrial rocks.

**KELLY TAYLOR**, University of California, Riverside

**ADVISOR:** Dr. Douglas Ming, NASA Johnson Space Center

**PROJECT:** *Heavy metal adsorption potential of zeolites.* This study should establish whether the use of zeolites in waste recycling for space station and planetary bases deserves further consideration.

**ANN THERRIAULT**, University of Ottawa

**ADVISOR:** Dr. Virgil Sharpton, Lunar and Planetary Institute

**PROJECT:** *What's shock and what's not.* Samples from a number of impact structures in both sedimentary and crystalline target rocks and samples from large explosive volcanic deposits will be examined. Standard petrographic universal stage techniques will be used. Samples of several K-T boundary sections will also be investigated.

## SPACEWEEK '88

A major question for Americans in 1988 is: "Will we regain and maintain our leadership in space, or will our country continue to be a second-class power in space?" To bring this issue into the public limelight during a national election year, space supporters are being urged to hold public events during Spaceweek '88, July 16-24.

"President Reagan's aggressive new space policy will fall upon the next administration for implementation," said Dennis Stone, president of Spaceweek. "Space supporters must act during this election year to ensure that it doesn't fall on deaf ears. Spaceweek '88 presents an established forum to make this issue widely known."

The theme for Spaceweek '88 is *Space: A Commitment to Our Future*. "This theme was selected in part because of the need for Americans, during this presidential election year, to take a long look at the American space program and make a commitment to support NASA's

programs—from the Space Station to manned missions to Mars," said Stone. "We at Spaceweek also hope, as do other space organizations across the country, that each of the presidential candidates will consider making a long-term commitment to the space program an important issue in this year's election."

Among the Spaceweek '88 activities will be model rocket launches, lectures, star parties, mall displays, tours of aerospace facilities, national symposiums, a special museum exhibit, and a space fashion show.

Headquartered in Houston, Spaceweek was created in 1980 by a handful of volunteers, and events were held in two cities. The staff has since grown to over 100 volunteers who disseminate information to a network of more than 70 cities from coast to coast that participate in the celebration.

Volunteers are needed for Spaceweek '88 to organize local Spaceweek celebrations sponsored by schools, civic groups, planetariums, libraries, and space-related societies. For information on how you can become a city coordinator for your community or volunteer in any other capacity, write to Spaceweek National Headquarters, P.O. Box 58172, Houston, TX 77258, or call 713-480-0007.

## MMI Introduces Portable Planetary System

A new, low-priced portable planetarium system has been introduced by MMI Corporation, creators and distributors of educational materials for astronomy, geology, and related disciplines. The *Einstein Portable Planetary System* includes a versatile projector displaying the entire north and south skies and featuring motorized daily motion. A choice of domes is offered, seating 20-30 observers. The system includes a manual, lesson plans, projection pointer, workshop guide, and a variety of instructional materials. System prices start at \$1450.00 F.O.B. Baltimore.

For an illustrated brochure containing full specifications and prices, write to:

**MMI Corporation**  
P.O. Box 19907  
Baltimore, MD 21211

Or call R. C. Levy, Sales Director, at 301-366-1222. Together with planetarium information, you will also receive current astronomy and geology materials catalogs.

# Telecommunications

## Lunar and Planetary Bibliography On-Line

With this issue of the *Lunar and Planetary Information Bulletin* (number 50), a new era and a new look begin. As part of the new look, the Current Awareness Bibliography is not being published in this issue. The bibliography is now so easily accessed through our Search Service using SPAN and other networks and telecommunication devices that we decided to try this as an experiment. We have the latest segment of the bibliography available and will be happy to send a copy if requested.

To review the bibliography, use the LIC Search Service, which can be accessed from SPAN using LPI::SEARCH (PASSWORD: LPI). Direct phone lines are 713-486-8214 or 9782, USERNAME: SEARCH (PASSWORD: LPI). The service is menu driven and has on-line HELP routines that can be accessed at any step by typing *HELP* at the prompt.

The LPI's computer is also accessible from other networks, such as the NASA Packet Switching System (NPSS), or from other Internet Nodes such as ARPANET, EDUNET. A brochure outlining these various techniques is available from Carolyn Kohring at the LPI address. Information about electronic access to the Institute was also published in the November 1987 issue of the *Bulletin* (p. 10).

If you have any difficulty making contact with the Lunar and Planetary Bibliography, call Stephen Tellier at 713-486-2191 or Fran Waranius at 713-486-2135. We will still respond to search requests by phone or letter if you prefer that method.

We would like to have input as to whether you believe it is necessary to provide the Current Awareness Bibliography in the *Bulletin*. We will make an editorial decision based on the response. Please let us hear from you. A postcard or brief note will do. Just say, "Put the bibliography back," add your name and address, and send it to:

**Library Information Center  
Lunar and Planetary Institute  
3303 NASA Road One  
Houston, TX 77058-4399**

We also accept E-Mail messages: on SPAN, contact LPI::FRAN; on NASAMAIL, contact EWARANIUS/NASAMAIL.

## Important Numbers

You may wish to clip and save the following numbers to aid in communicating with the LPI.

**LPI Telex Number:** 7400832,  
Answerback: LAPI UC

**LPI FAX Number:** 713-486-2162  
(after July 1)  
713-483-3913 (through JSC, before July 1)

**LPI SPAN Node Name:** LPI

For help with communications problems, contact:

**Carolyn Kohring  
713-486-2192  
LPI::KOHRING on SPAN  
[KBURKE/NASA]  
NASAMAIL/USA**

## LPI to Acquire FAX Transceiver

The LPI expects to complete acquisition and installation of a Facsimile Transceiver by July 1. The FAX will operate in an unattended mode and will be located upstairs in the main building of LPI. We hope to receive timely reviews of proposals by this means. Instructions for transmission will be sent with the proposals. Please note: **ABSTRACTS AND THEIR RELATED FORMS AS WELL AS ORIGINAL MANUSCRIPTS WILL NOT BE ACCEPTED BY FAX.** The phone number for this FAX will be 713-486-2162.

Until this machine is installed, you may send facsimile messages to the LPI through the Johnson Space Center. The phone number for JSC's Communications Center is 713-483-3913 or 713-483-3914. Please include a cover page with your message stating the following:

**Message for (addressee)  
Lunar and Planetary Institute  
MAIL CODE: LPI**

## Network Information Centers Available to SPAN & Internet Users

We know of two Network Information Centers (NICs) available to SPAN and Internet Users that can provide several useful services: SPAN-NIC and NICOLAS. Both NICs have been very helpful to us at the LPI.

### SPAN-NIC

The SPAN Network Information Center (SPAN-NIC) is located at the National Space Science Data Center (NSSDC) at NASA/Goddard. Its purpose is to provide general user services and technical support to SPAN users. From a SPAN node, type:

**\$ set host nssdca  
USERNAME: SPAN-NIC**

A menu-driven program will guide you through the available services. Selections on the main menu include: (1) SPAN Information, (2) Query SPAN Database for NODE Information, (3) Access SPAN Library of Documents, (4) SPAN Intermail Addresses—proper syntax, (5) SPAN Important News Briefs, and (6) Submit NODE's Information. Information is regularly checked and updated by the SPAN-NIC Manager.

### NICOLAS

Goddard's Advanced Data Flow Technology Office has established a network information center known as DFTNIC. This center includes the Network Information Center On-Line Aid System (NICOLAS). NICOLAS instructs users on how to perform remote logins and file transfers, how to communicate with users on other networks via electronic mail, how to use specific types of communications software, and who to call for further help or information. NICOLAS can also serve as a bridge to other NICs and databases and can carry out remote logins and/or file transfers for users between networks. To log onto NICOLAS from a SPAN node, type:

**\$ set host dftnic  
USERNAME: DFTNIC**

To log onto NICOLAS from an Internet node (TCP/IP), type:

**\$ telnet dftnic  
USERNAME: DFTNIC**



# AVAILABLE FROM LPI



## — BOOKS —

### **ORIGIN OF THE MOON—W.K. Hartmann, R.J. Phillips, G.J. Taylor, eds.**

*Origin of the Moon* provides a synthesis of models and theories about the formation of the Moon. In this collection of 33 original research and review papers are the findings and contributions of both data analysts and planetary theorists. There are historical reviews covering the early history of scientific thinking as well as scenarios based on the post-Apollo views. The book includes papers discussing the traditional scenarios of capture, fission, and coaccretion. Two additional ideas—the impact-trigger model and a coaccretional “composition filter” model—are also presented. Dynamic, geochemical, and geophysical constraints are explored in detail.

**Hardcover, 800 pp., 187 figures, glossary, subject and author indexes**

**Order Code: B-ORIGIN, \$25.00**

### **LUNAR BASES AND SPACE ACTIVITIES OF THE 21ST CENTURY—Edited by W.W. Mendell**

This book contains 90 individual articles which address the various problems and opportunities associated with development of a manned base on the Moon. Also included are ideas for missions to Mars and other proposed space activities of the twenty-first century. It is an informative, referenceable text for research scientists and college students as well as interested laymen and is heavily illustrated with diagrams, photos, and artists' conceptions. As applicable to lunar occupation, the technology discussed encompasses agriculture, architecture, astronomy, engineering, economics, geology, hydrology, medicine and health, mining, manufacturing, physics, and space research.

**Softcover, 865 pp., 211 figures and illustrations, indexes, references**

**Order Code: B-BASES, \$20.00**

### **PLANETARY SCIENCE: A LUNAR PERSPECTIVE—S. Ross Taylor**

This publication is an excellent synthesis of information on our understanding of the nature, origin, and evolution of the solar system. It addresses such topics as: planetary geology and stratigraphy; meteorite impacts, craters and multi-ring basins; planetary surfaces and crusts; basaltic volcanism and planetary interiors; and the chemical composition of the planets. In addition to the text, this book offers 24 pages of appended material. It has become a definitive reference work for the planetologist as well as the astronomer.

**Hardcover, 481 pp., 176 illustrations, glossary, index**

**Order Code: B-PLANS, \$30.00**

### **CHONDRULES AND THEIR ORIGINS—Edited by E.A. King, Jr.**

*Chondrules and their Origins* contains 25 review papers and original research contributions designed to provide the reader with a broad knowledge of the most recent data regarding the origin and history of chondrules. As a resource text, it also provides an extended bibliography of 467 related papers.

**Hardcover, 375 pp., 129 figures and tables, subject index**

**Order Code: B-CHON, \$25.00**

## — SLIDE SETS —

**Each set includes an explanatory booklet.**

**STONES, WIND, AND ICE: A GUIDE TO MARTIAN IMPACT CRATERS** This set of 30 slides, compiled largely from Viking Orbiter and Lander images, illustrates both the diversity of impact craters on Mars and the significance of these features in understanding the geological evolution of this complex planet. Many of the landforms produced by the interaction of the cratering process with the Martian environment are seen virtually nowhere else in the solar system. Impact craters also provide a means of deducing the sequence and timing of events that have shaped the Martian surface. (30 slides)

**Order Code: S-STONES, \$13.00**

**VOLCANOES ON MARS** This slide set illustrates various geologic features on Mars. The set includes some of the best examples of Viking Orbiter images that include constructional volcanic landforms. Approximately half of the slides deal with the large shield flows on the flanks of the volcanoes. The remainder of the slides shows various constructs (classified as Mons, Patera, or Tholus) from the Tharsis, Elysium, and Hellas regions as well as the km-sized mounds that are interpreted to be of volcanic origin. (20 slides)

**Order Code: S-VOLCA, \$10.00**

**APOLLO LANDING SITES** This set of 40 slides provides photographic coverage of the regional setting for the six Apollo landing sites. This collection shows the sites at a variety of scales ranging from Earth-based telescopic views spanning hundreds of kilometers to high-resolution photographs taken from lunar orbit. Descriptions giving geological details for each area are included in the accompanying booklet. Useful for educators and researchers who wish to show the regional setting of samples and photographs returned by the Apollo missions. (40 slides)

**Order Code: S-APOLLO, \$15.00**

**(Over, please)**

## SLIDE SETS— *continued*

**SHUTTLE VIEWS THE EARTH: THE OCEANS FROM SPACE** This slide set offers a selection of the most fascinating and informative Shuttle photographs of the oceans and features images taken with a variety of equipment. Naturally-occurring sea surface features have been photographically recorded, as well as the meteorological and oceanic influences on land masses. (40 slides)  
**Order Code: S-OCEAN, \$15.00**

**SHUTTLE VIEWS THE EARTH: CLOUDS FROM SPACE** This slide collection includes some of the most informative and visually impressive cloud photographs taken in twenty-four Shuttle missions. The accompanying booklet has a foreword by astronaut Robert Crippen. The unique perspective of Shuttle photography helps us to understand weather patterns and the development of weather systems worldwide. (40 slides)  
**Order Code: S-CLOUD, \$15.00**

**SHUTTLE VIEWS THE EARTH: GEOLOGY FROM SPACE** Photographs of stunning geological features on the Earth have captured the attention of Shuttle astronauts mission after mission. Shuttle photographs enable us to trace fault margins in the Earth's crust and observe large structures, such as meteor impact craters, in their entirety and in the context of their surroundings. The images reveal how much of the Earth's surface is covered by vast deserts and also provide comparisons of old volcanic structures with young erupting volcanoes at various locations around the world. (40 slides)  
**Order Code: S-GEOL, \$15.00**

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## — REPORTS & CONTRIBUTIONS —

Available for the cost of shipping and handling except as noted below.

**Order Code: R-85-02** WORKSHOP ON DUST ON MARS. S. Lee

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## Computer Network Materials Available From the LPI

Carolyn Kohring at the LPI has compiled several pamphlets for those using computer networks to communicate with others. If you would like any of these pamphlets, contact her at 713-486-2192, LPI::KOHING on the SPAN network, or [KBURKE/NASA] NASAMAIL/USA from any Telemail system.

### LPI Computer Access

This short pamphlet gives step-by-step instructions for connecting to the LPI VAX computer. Instructions are given for access by Direct Dial and from the NASA SPAN network, NPSS (NASA Packet Switching System), and Internet networks. Users may access databases in the Geophysical Data Facility, Planetary Information Center, Library Information Center, and Conference Programs. Telemail Systems Accounts at the LPI are also listed.

### Directory of Electronic Mail Addresses

The LPI began collecting electronic mail addresses in March 1987. Prior to the Lunar and Planetary Science Conference in March 1988 approximately 300 of these addresses were compiled into a Preliminary Directory of Electronic Mail Addresses. Addresses come from interest forms submitted for the conference and in response to a questionnaire in an earlier issue of the *Bulletin*. A new issue of this directory with corrections and additions received during and shortly after the conference will be distributed in early June.

### Network Interconnections

This three-page pamphlet lists addressing conventions between networks for some of the more common networks. Examples are included for sending messages between the Telemail Systems, Internet networks, SPAN, BITNET, UUCP, and CSNET. Multiple gateways between networks are listed where possible.

### LPI Telex Number

The LPI can now send and receive messages through the Telex system. All Telex messages sent to this number are automatically routed to an LPI Telemail account. The LPI Telex Number is 7400832. Answerback is LAPI UC.

If you have a Telemail account and would like information on how to obtain a Telex number, type *HELP TELEX* at any command prompt.

## Publications

### In Darkness Born: The Story of Star Formation

by Martin Cohen

Cambridge University Press  
\$19.95 (ISBN 0-521-26270-4)

Cohen has undertaken the difficult task of bringing some of the new research on star formation generally printed in such scholarly publications as *Astrophysical Journal* or *Astronomical Journal* to the popular level. This book presents the basic physical and astronomical ideas necessary for the lay reader to grasp the nature of our galaxy and the way in which its stars formed. These basic concepts are used to develop a theoretical picture of the formation of stars from giant clouds of dust and gas, and to understand the observational evidence of young and maturing stars in terms of the various astronomical measurement techniques (notably optical, infrared, radio, X-ray, and ultraviolet observations).

The book began as a popular lecture and grew from the course work Dr. Cohen developed for a "nonmathematical, gentle on the physics, descriptive treatment of all the current frontiers in astronomy" (author's preface), which was given as an extension course in the adult education wing of the University of California at Berkeley. I found the book easy to read—almost conversational in style—and an excellent introduction to this complex and fascinating subject.

—Fran Waranius

Order from Cambridge University Press or any bookstore.

Cambridge University Press  
32 East 57th Street  
New York, NY 10022

### A.S.P. Slide Set on the Search for Extraterrestrial Life

A new slide set on the scientific search for life in the universe has been released by the Astronomical Society of the Pacific. The set of 20 color slides is accompanied by a 20-page booklet of captions and background information by Dr. Frank Drake, who conducted the first serious search for extraterrestrial radio messages in 1960.

The slides include the message plaque sent on Pioneer 10 and 11, the Voyager interstellar record (nicknamed "the greatest hits of Earth"), a graph of the radio profile Earth would show from a nearby star, radio telescopes and other equipment used in Drake's 1960 search (as well as in some of the later searches), and the new equipment being prepared by NASA to search 10 million radio channels at once.

The booklet contains clear, detailed captions for each slide, a nontechnical history and introduction to the field, a glossary, and a thorough reading list. It is designed for use by anyone, regardless of science background.

To order, send \$20.50 (price includes postage and handling; outside the U.S., please send \$24.50) to:

A.S.P.  
SETI Slides Department  
390 Ashton Avenue  
San Francisco, CA 94112

Please note that this is the new address for the Astronomical Society of the Pacific as of April 10.



# PLANETARY CARTOGRAPHY WORKING GROUP IMAGE DISPLAY AND PROCESSING USER SUMMARY

Dear Colleague:

The Planetary Cartography Working Group advises the Planetary Geology and Geophysics Program of the Solar System Exploration Division, Office of Space Science and Applications, National Aeronautics and Space Administration, on matters regarding planetary cartographic products.

In order to assess the potential number of users and the user needs for a planetary image database, we are asking the planetary science community to answer the following questions. This information will be used for planning purposes. The Voyager Project is currently producing a set of CD-ROMs (Compact Disc-Read Only Memory) with both image and nonimage science data. Plans are also being developed to produce a set of CD-ROMs with the Viking image data set. The Magellan Project will also distribute Venus image data on CD-ROMs.

If you are interested in receiving information, we would appreciate your taking the time to fill out and return this sheet.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Your NASA program affiliation: *e.g.*, Voyager, Planetary Data System, Planetary Geology and Geophysics:

I would like to be placed on the distribution for future CD data sets:

Yes: \_\_\_\_\_ No: \_\_\_\_\_

1. Do you have access to a computer that is used to display or process digital image or cartography data?  
What kind?

2. Do you currently display or process images from tape?  
CD-ROM (Compact Disc)?  
Other?

3. Do you plan to acquire an image display/processing capability?

What kind?  
(*e.g.*, PC, VAX, SUN, Mac, Other)

4. What data sets would you want on CD before you would invest in a CD reader?

5. Do you use a PC or expect to get one in the near future?

6. What network do you have easiest access to?

Thank you for taking the time to provide this information. A summary of the responses and information about where to find out more about obtaining planetary data will appear in a future issue of the *Bulletin*.

Return to:

Lita Holley  
Panel Office  
Lunar and Planetary Institute  
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# LUNAR AND PLANETARY REVIEW PANELS AND WORKING GROUPS

The following list of review panel members is published here for your convenience due to the many requests received by the LPI Panel Office.

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# Calendar

## June

25-July 3

**100th Annual Meeting of the Astronomical Society of the Pacific/ 1988 General Assembly of the Royal Astronomical Society of Canada/ 1988 Summer Meeting of the Western Amateur Astronomers,** British Columbia, Canada. *Mary Ransberry, Conference Services, University of Victoria, P. O. Box 1700, Victoria, BC V8W 2Y2 Canada. Phone: 604-721-8465.*

## July

13-15

**Workshop on Antarctic Meteorite Stranding Surfaces,** Pittsburgh, Pennsylvania. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

18-22

**51st Meteoritical Society Meeting,** Fayetteville, Arkansas. *Derek Sears, Department of Chemistry, University of Arkansas, Fayetteville, AR 72701. Phone: 501-575-5204.*

## August

1-12

**Earth, Air, Fire and Water: Nonlinearities in Geophysics and Astrophysics,** Los Angeles, California. *Gerald Schubert, Department of Earth & Space Sciences, UCLA, 3806 Geology Building, Los Angeles, CA 90024. Phone: 213-825-4577.*

24-26

**Symposium on Exobiology in Solar System Exploration,** Moffett Field, California. *Judith Huntington, NASA Ames Research Center, MS 239-12, Moffett Field, CA 94035. Phone: 415-694-4204.*

## September

21-23

**Dust on Mars III,** Estes Park, Colorado. *LeBecca Turner, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2158.*

## October

5-7

**Early Tectonic and Volcanic Evolution of Mars,** Easton, Maryland. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

20-23

**Global Catastrophes in Earth History: An Interdisciplinary Conference on Impacts, Volcanism and Mass Mortality (Snowbird II),** Snowbird, Utah. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

## November

14-16

**Moon in Transition: Apollo 14 and Extreme Lunar Differentiation,** Houston, Texas. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

## December

1-3

**Origin of the Earth,** Oakland, California. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

## January 1989

10-12

**Analysis of Returned Comet Nucleus Samples,** San Francisco, California. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

## March

13-17

**20th Lunar and Planetary Science Conference,** Houston, Texas. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

## July

25-26

**Cosmogenic Nuclide Production Rates in Meteorites,** Vienna, Austria. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

27-28

**Differences Between Antarctic and Non-Antarctic Meteorites,** Vienna, Austria. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*

31-August 4

**52nd Meteoritical Society Meeting,** Vienna, Austria. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.*



The *Proceedings* is copublished this year by the Lunar and Planetary Institute and Cambridge University Press and comprises 64 papers that outline current developments in our understanding of planetary geology and petrology, particularly of the Moon and the solid planets in the solar system. The papers range from giving details of lunar samples to proposing theoretical models of processes in the early solar system. A number of papers deal with the important ongoing work to understand the origin and evolution of the Moon. The papers are organized under eight general headings as follows: petrogenesis and chemistry of lunar samples; geology and petrogenesis of the Apollo 15 landing site; lunar geology and applications; cratering records and cratering effects; differentiated meteorites and related studies; chondritic meteorites and asteroids; extraterrestrial grains; Venus, Mars, and icy satellites. The book also contains author, subject, sample, and meteorite indices. The

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