



May 1987

Number 47

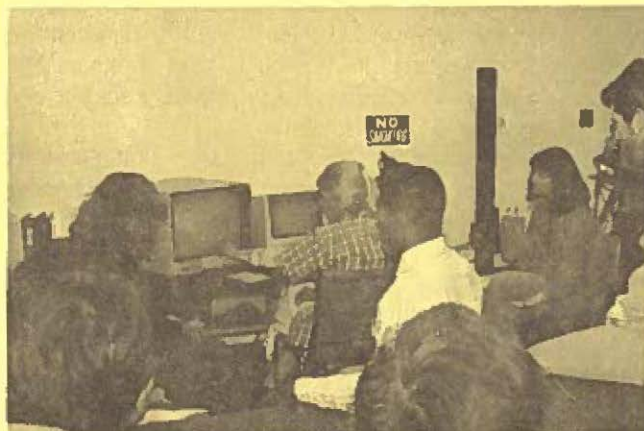
**XVIIIth LPSC - BIGGER AND BETTER!**

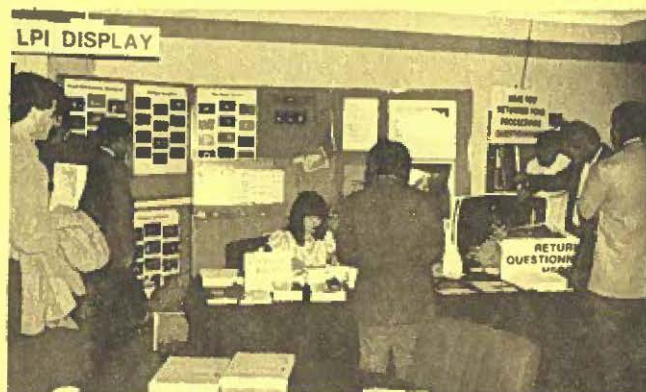
The Eighteenth Lunar and Planetary Science Conference was held at the NASA Johnson Space Center (NASA/JSC) in Houston on March 16-20, 1987. Conference sponsors were: the Lunar and Planetary Institute (LPI); NASA/JSC; the American Association of Petroleum Geologists (AAPG), the American Geophysical Union (AGU); the Division for Planetary Sciences of the American Astronomical Society (DPS); the Geological Society of America (GSA); the International Union of Geological Sciences (IUGS) and the Meteoritical Society.

The program was prepared from the 595 abstracts submitted to the conference. The Program Committee consisted of:

Chairmen: Kevin Burke, LPI; Michael Duke, NASA/JSC, and William Phinney, NASA/JSC

Members: Richard Becker, University of Minnesota; A. E. Bence, Exxon Production Company; Mark Cintala, NASA/JSC; James Garvin, NASA Goddard Space Flight Center; Jay Goguen, Jet Propulsion Laboratory; Cyrena Goodrich, University of Arizona; Richard A. F. Grieve, Geological Survey of Canada; B. Ray Hawke, University of Hawaii; Paul Helfenstein, Cornell University; Dieter Heymann, Rice University; Harold Masursky, U.S. Geological Survey; Gordon McKay, NASA/JSC; William B. McKinnon, Washington University; Richard Morris, NASA/JSC; Donald Morrison, NASA/JSC; Larry Nyquist, NASA/JSC; Dimitri A. Papanastassiou, California Institute of Technology; Robert O. Pepin, University of Minnesota; David Pieri, Jet Propulsion Laboratory; Graham Ryder, LPI; L. A. Taylor, University of Tennessee; Charles Wood, NASA/JSC; James Zimbelman, LPI; and Michael Zolensky, NASA/JSC.

**LPSC PROCEEDINGS MANUSCRIPT DEADLINE MAY 29, 1987**



Six hundred and eighty scientists representing 18 countries attended the Conference. Three concurrent sessions were conducted each morning and afternoon of the four and one-half day conference. Marilyn Lindstrom organized a LAPST-sponsored session *"Symposium: Lunar Geoscience Observer (LGO) and Future Lunar Exploration"* which was held on Tuesday morning. The first invited talk *A Field Geologist's Return to the Moon* was presented by Dr. Harrison H. Schmitt. The other two morning sessions were delayed to allow all of the conference participants to hear Dr. Schmitt's presentation. A second special session *The Onset of Accretion* organized by Jeff Cuzzi, NASA Ames Research Center, was held Wednesday evening at the Gilruth Center. A special abstract volume of the seven invited talks given at this session was distributed to the audience.

Two public sessions were held at the NASA/JSC Visitor Center Auditorium on Monday and Tuesday evenings. The Monday evening session *Future Exploration of Mars* was organized by Dr. Louis Friedman and sponsored by the Planetary Society. Tuesday evening's session was organized by Dr. Michael Duke and sponsored by NASA Headquarters. The session was titled *Planetary Exploration in the 1990's and Beyond*.

Thursday evening's social event, the *Tex-Mex Fiesta* was a popular event for all conference goers. A very special happening during the evening was the presentation of an award to Jonathan Eberhardt, *Science News*. This award was presented to Jonathan for his many contributions to the advancement of planetary science through his reporting of the science and interests of the planetary science community. Jonathan has reported first-hand on various missions such as Apollo, Viking, and Voyager, and the Lunar and Planetary Science Conference for many years. It is anticipated that this award may be presented in subsequent years to others who have made valuable contributions to planetary science and the community.

The Proceedings of the XVIIIth Lunar and Planetary Science Conference will be published by Cambridge University Press. *Lunar and Planetary Science XVIII: abstracts of papers presented to the conference* is still available. To obtain a copy send \$5.00 for U.S. mailing or \$8.00 for surface book rate mailing to foreign countries to the **Order Dept.** at the LPI. An order form was published in the February 1987 issue of the LPIB.

## Why an Abstract Deadline? The Editor Replies. . .

January 21, 1987. . .the deadline for abstracts for LPSC XVIII.

You think *YOU* didn't look forward to it! The entire Publications Staff knew that the extra week allowed authors would help, but the compressed time span for Program Committee preparation was dreaded.

The trickle of early submissions was the standard trickle, at first. . . the usual one or two abstracts a day. As the deadline approached, the trickle increased. People who never had submitted on time submitted early this year. Others kept asking, "What happens if I miss the deadline?" "What happens if IT comes in after 6:00 P.M.?" "What happens if IT comes in the next day?" "What happens if IT gets lost in the mail?" "What happens if I Federal Express IT on the day of the deadline?"

Slowly it came, week-by-week, day-by-day. Then the phone calls started. "I have mine written, but IT isn't mailed yet." "IT's coming from Europe and we've had dreadful snow storms here." "You know, Monday is a postal holiday because it's Martin Luther King's Birthday. . . do you celebrate that in Texas?" "I'm waiting for my data to come in. . . what is the absolute latest I can mail?" "IT's in the word processor, but my secretary is on vacation and she is the only one who knows how to operate the machine!"

**Deadline Day.** The stream of express delivery trucks was constant. There were delivery services that no one had EVER heard of, but they brought abstracts to the LPI on time! The waste baskets were borrowed from other offices and piled with empty envelopes and empty cartons, and paper clips soon filled holders to the brim. Each abstract was date

stamped with the date of arrival at LPI and logged in as quickly as possible.

**"Logged in."** Do you really know what that means and how important it is to the preparation of conference publications and program?

It took staff from five departments at the LPI to accomplish the massive log-in of abstracts for LPSC XVIII. Over 300 hours were charged to conference preparation during the two-week period of January 10-24. Of course there were other departmental matters and ongoing LPI business to attend to, so a lot of this 300 hours reflects overtime.

Each set of abstract and forms is checked to make sure the Information Form has been completed and the Copyright Release Agreement is present and signed. There must be an adequate number of copies, in addition to the camera-ready original. The abstract must be in good enough condition to be reproduced and bound into the Conference volume.

If any of these conditions are not met, and because there isn't enough time to contact the authors and have the missing information supplied or the original retyped, etc., the missing information is supplied and the errors are corrected by LPI staff.

Each abstract is assigned a unique number so that it can be entered into the computer. The number is written on the original, on the forms, and on the copies.

It is very important that the Information Form be filled in completely and accurately. There are dozens of manipulations of this information performed after it is entered into the computer system. Because of the tight time schedule, there isn't time to re-enter the information for every use of it. So the log-in must be complete and accurate. Yes, we do need: a correspondence author and the complete, accurate mailing address and phone number, indications of willingness to serve as session chairman and preferred mode of presentation, the ONE topic the abstract is appropriate for, key words and sample numbers, and pertinent comments.



What do we do with this information?

1. Build an address file that is used to generate mailing labels for the cards sent to everyone who submitted, notifying them of the mode of presentation for his/her paper, as well as letters to request preparation of press abstracts.

2. Provide to the Program Committee a listing of abstracts and authors which they use to: determine oral, written, and poster presentations; contact authors to discuss changes in presentation, acceptance of session chairmanship, etc.; arrange speakers within each session.

By the way, it takes one hour for the laser printer to produce one printout for the Program Committee. The additional copies of printouts for the Committee, at 300 pages per printout, consume 12 hours of Kodak copier time and 2 cartons of paper.

3. Assemble applicable data through a variety of computer programs and typeset the printed Conference program.

4. Build the author, keyword, and sample word indexes.

5. Establish a set of abstracts organized by topic numbers. This set is used by the Program Committee to order the talks within each session and to select abstracts suitable for press abstract preparation.

6. Establish a set of abstracts organized by manuscript number.

7. Establish a set of abstracts organized by author.

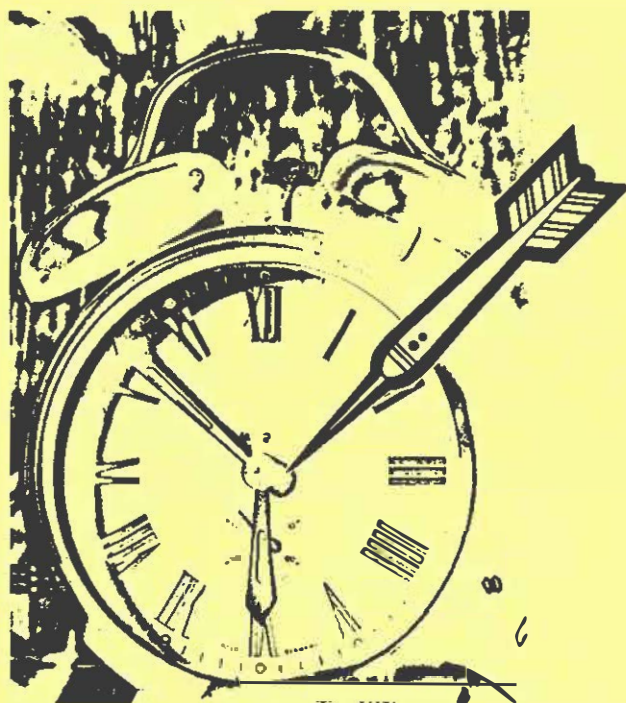
8. Establish a set of original abstracts to be used for printing.

9. If any permissions are needed because of the use of or reference to copyrighted material, write the holder of the copyright as identified on the Information Form.

Well, it worked in 1987. In fact, it worked so well that we are doing it again in 1988. The deadline for submission of abstracts to the Publications Office is January 20, 1988. This gives authors advance notice and the maximum time we can allow between Christmas holidays and the Program Committee meeting. I'm glad that it helps encourage submissions and it accommodates the schedules of most authors. I'm hopeful that you will have read this and have a better perspective of *"why the deadline."*



Stephanie Tindell  
LPI Managing Editor



## **FIRST ANNOUNCEMENT ABSTRACT DEADLINE FOR LPSC XIX JANUARY 20, 1988**

Please mark January 20 on your 1988 calendar! It's the deadline for abstracts for the Nineteenth Lunar and Planetary Science Conference.

Mail early!! Don't let the Christmas holidays, seasonal snowstorms, or U.S. Postal Service holidays jeopardize your submission.

If you have any questions, please call Stephanie Tindell, Managing Editor, LPI Publications Office, 713-486-2143 or by electronic mail NASA/SPAN LPI::Tindell.

## **HARDCOVER COPIES OF PAST PROCEEDINGS - NO GO!**

In the November 1986 of the *LPIB*, LPI solicited interest in purchasing hardbound copies of the LPSC Proceedings published with the American Geophysical Union (the 13th, 14th, 15th, 16th).

Eleven people responded by identifying which issues they would be interested in ordering.

Due to the constraints of inventory and binding costs for such a limited quantity, LPI has decided that it would not be advisable to offer this service.

For those who are steadfastly interested, soft cover volumes are available from AGU. Perhaps individuals could arrange through their own facility librarians to have these volumes bound.

## LPI SUMMER INTERN PROGRAM PARTICIPANTS

From the applications for the intern program which have been received, the following students have been selected to participate in the Summer Intern Program at the Lunar and Planetary Institute. The program, now in its eleventh year, 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 Johnson Space Center. During the ten-week period the interns will have the opportunity to attend lectures and seminars given by various scientists in the space science programs. In mid-August there will be a mini-conference at which each of the interns will present the results of the research they have conducted during the summer.

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

*TRACEY BRADLEY, University of Alberta*

**ADVISOR:** Nadine Barlow, Lunar & Planetary Institute

**PROJECT:** Data contained in the existing martian crater catalog will be analyzed to determine if any relationships exist between crater interior morphologies and a number of physical parameters. The interior morphologies to be considered are central peaks, peak rings, pristine flat floors, and flat floors with deposits. The parameters against which these morphologies will be tested for any dependence include (but are not necessarily limited to) diameter, terrain type, latitude, and ejecta characteristics. The intern will use various combinations of these parameters (displayed primarily in graphical and tabular form) to determine which of these apparently control formation of the various interior morphologies. This study is an important portion of a larger project studying the role of various parameters on the formation of ejecta and interior morphologies associated with martian impact craters.

*KIMBERLY LYNN DOW, Marlboro College*

**ADVISOR:** Faith Vilas & Karl Henize, NASA Johnson Space Center

**PROJECT:** Debris caused by hypervelocity impact between objects in space or explosions due to unspent fuel in rocket stages is becoming a considerable hazard to spacecraft and astronauts on EVA in low Earth orbit (LEO). A variety of astronomical data on LEO debris has been collected to characterize the debris. These include data from two 31" telescopes operated by Lincoln Laboratories, MIT. A total of 38.1 hours of both raw video data from one or both telescopes, and "processed" video data (negatively added data from both telescopes) have been obtained. Streaks caused by orbital debris have been identified by Lincoln Labs. This project will involve (1) analyzing the processed tapes for altitude, inclination, and angular velocity of the debris particles, and (2) analyzing, as much as is practicable, the raw videotapes

for magnitude data on the debris particles. These data can then be combined with existing information to update the LEO debris model and address other questions about orbital debris. The intern will use the Video Digital Analysis System (new image processing system) to study the tapes. Some knowledge of image processing, astronomy, and programming will be applied.

*MAURA HANNING, Cornell University*

**ADVISOR:** L. D. Ashwal, A. V. Murali & D. Elthon, Lunar & Planetary Institute

**PROJECT:** The Diana Complex is a Proterozoic granitoid intrusion located at the boundary between the Adirondack highlands and lowlands in upstate New York. Although it has been deformed (shearing and amphibolite-grade metamorphism), the Complex preserves variation in rock chemistry, presumably produced by primary differentiation. For example, there are layers rich in Fe-Ti oxides and pyroxenes, which can only be interpreted as cumulates. Such differentiation is unusual for granitoid plutonic complexes and the intern's project involves a geochemical study of the Complex in an attempt to understand these processes. Analytical tools to be used include instrumental neutron activation analysis (INAA) for trace elements and X-ray fluorescence spectrometry (XRF) for major elements. One goal of the trace element study is to determine whether the Complex exhibits sufficient variability in light rare earth elements to attempt Sm-Nd isotopic geochronology.

*LISA YVETTE HENRY, Northwest Nazarene College*

**ADVISOR:** James Zimbelman, Lunar & Planetary Institute

**PROJECT:** The project involves the reduction and analysis of the highest spatial resolution thermal infrared data of the Oxia Pallus and Margaritifer Sinus quadrangles of Mars (30°N to 30°S, 0° to 45°W). Geologic features of particular interest in this region include four large outflow channels that drain into the Chryse basin, chaotic terrain at the eastern end of the Vallis Marineris canyon system, and both low and high albedo deposits throughout the densely cratered highlands. The thermal data will be processed into digital thermal inertia images that are overlaid on digitized versions of maps and photomosaics to assess the physical properties of specific surface features. The thermal inertias will provide constraints on the particle size and/or induration condition of surface materials which can be used to assess the relative importance of the processes that formed or modified the surface. This work will extend the coverage of data processed during previous Summer Intern projects.

*MAGGIE YEUK MUI LEE, Bryn Mawr College*

**ADVISOR:** T. H. Morgan, NASA Johnson Space Center

**PROJECT:** The project will be based on a program of observations of the emission due to sodium and potassium in the atmosphere of Mercury. From the intensities of the emission lines the mass of sodium in the atmosphere on

the date of the observation can be determined. Following the change in the total mass of sodium and potassium over time may lead to a determination of the processes which place sodium into the atmosphere and of those which remove it. If this can be done, it should be possible to determine the mass fractions of sodium and potassium in the regolith of Mercury, or at least, place limits on these quantities. The intern will participate in all phases of the work: observations of the planet, reduction of the spectra to intensities, and analysis of these data.

*VICTORIA A. LEVIN, San Joaquin Delta College*

**ADVISOR:** David McKay, NASA Johnson Space Center

**PROJECT:** The project is a scanning and transmission electron microscope study of agglutinate particles from lunar soils. The objectives include constructing a classification based on morphology, determining clast/glass ratios and characterizing the fine-grained metallic iron inclusions. A major question is whether residue from the meteorite which made the agglutinate is still present and detectable. Energy dispersive analysis will be used to search for carbon, nickel, and other elements likely to be from the projectile. Agglutinates are the major component of mature lunar soils, and a more complete understanding of their relationship to meteorites is a very important objective which can lead to an understanding of the micrometeorite complex over the past billion years.

*PATRICIA STAR MANNION, Earlham College*

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

**PROJECT:** The study of the abundances and distributions of hydrogen in lunar materials is important because it provides basic information on the availability of potential consumables on the lunar surface. The project will involve the separation and analysis of hydrogen in individual mineral and glass phases present in grain size separates of lunar soils. Pyrolysis-gas chromatography will be used for the analysis of the hydrogen present in the soil components. The information obtained from the study will be used to determine if sufficient hydrogen is present in the lunar regolith for recovery in support of a possible lunar base.

*STEPHAN J. MOJZSIS, Boston University*

**ADVISOR:** Bruce Bills, Lunar & Planetary Institute

**PROJECT:** Many of the valleys in east-central Nevada contain suites of well-developed shorelines of late Pleistocene paleolakes that were roughly contemporaneous with the much larger Lake Bonneville, which covered much of the western half of Utah. The objective of this project will be to make a detailed examination of satellite images (Landsat and HCMM), aerial photographs and topographic maps of six of these lakes (Clover, Franklin, Diamond, Spring, Maxey and Carpenter) in order to 1) estimate the amount and direction of tilt recorded by each of several prominent

shorelines in each basin, 2) determine the area of the lake and the distribution of erosional versus depositional features on each of these shorelines. A regional climatic and neotectonic synthesis will be attempted. These results will be compared with inferences derived from previous Lake Bonneville studies.

*DIANE C. NIELSEN, Cornell University*

**ADVISOR:** V.L. Sharpton, L.D. Ashwal & D.L. Elthon, Lunar & Planetary Institute

**PROJECT:** The Uvalde (Big Bluff) impact crater is a structure, 2.4 km in diameter, located in Zavala County of west Texas. The impact was emplaced into Eocene sandstones (Carrizo Formation) and associated shales, both of which constitute the primary ejecta material. This crater has only been cursorily studied. The project for the intern could involve some or all of the following types of studies: field mapping, sample collecting, and rock characterization, including microscopic petrography and chemical analysis for major and trace elements.

*AURORA PUN, California State University*

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

**PROJECT:** Interplanetary Dust Particles (IDP's) include micrometeorites, cometary dust, and possibly interstellar grains. Thus, these extraterrestrial particles include the most primitive material available for laboratory analysis and characterization. Last year, the first IDP's were recovered from 100,000- to 700,000-year-old Antarctic ice samples. The project for this summer will involve locating prospective IDP's from melted Antarctic ice employing a Scanning Electron Microscope (SEM). Size, morphology and bulk chemistry of candidate particles will be determined during this procedure. The most promising particles will then be transferred to a Transmission Electron Microscope (TEM) for phase characterization by Electron Diffraction techniques.

*KEVIN RIGHTER, Haverford College*

**ADVISOR:** Gordon McKay, NASA Johnson Space Center

**PROJECT:** The work will involve measuring the AC electrical conductivities of silicate melts, and using conductivity changes to detect the onset of crystallization. The project involves performing crystallization experiments in one-atmosphere gas mixing furnaces, monitoring conductivities during experiments, and performing petrographic and in some instances microprobe analyses of quenched charges to correlate results with conductivity changes. Technical questions to be addressed include determining the minimum degree of crystallization which can be detected, and determining to what degree conductivity changes due to crystallization can be differentiated from those due to other factors, such as loss of iron or volatiles. The scientific product will be a study of the nucleation behavior and duration of crystal growth during isothermal experiments on one or more olivine-saturated melts.

*ERIC PAUL RUBENSTEIN, Columbia University*

**ADVISOR:** Stephen Clifford, Lunar & Planetary Institute

**PROJECT:** The project will focus on the continued development of the Mars Thermal Model (MARSTHERM), a FORTRAN 77 finite-difference program that computes surface and subsurface temperature variations throughout the martian year. Because of the program's potential utility to other investigators, the code is being written with the intent that it be easily understood, readily modifiable, and essentially system-independent. An initial release of the program and full documentation is anticipated for early September.

*DAVID ALAN SWARTZ, University of Wisconsin - Parkside*

**ADVISOR:** Virgil Sharpton, Lunar & Planetary Institute

**PROJECT:** This research project will involve examination of Lunar Orbiter, Apollo, and Viking images to provide constraints on the spatial distribution, timing and mode of origin of tectonic features on the Moon and Mars. Specifically, the research will involve the following:

(1) A detailed comparison of tectonic landforms within the lunar mare basins (mare ridges and linear rilles) with those on the ridged plains of Mars.

(2) An analysis of stratigraphic relationships between intersecting tectonic features, impact craters and volcanic unit boundaries for constraints on the mechanism and timing of rille and ridge formation.

(3) A search for indications of compressional, strike-slip and extensional deformation in the lunar highlands and the ancient cratered terrain of Mars.

The results of this study will be examined for implications regarding (1) the origin and deformational history of the plains units, (2) the relative importance of regional (load-induced) vs. global (thermal) stress fields in the development of the tectonic features, and (3) the initial thermal state of the Moon and Mars.

## **LUNAR BASES AND SPACE ACTIVITIES OF THE 21ST CENTURY—2ND SYMPOSIUM**

The second symposium on Lunar Bases and Space Activities of the 21st Century will be held in Houston, at the Westin Galleria Hotel on April 5-7, 1988. This meeting is co-sponsored by the American Institute of Aeronautics and Astronautics (AIAA), the NASA/Johnson Space Center, and the Lunar and Planetary Institute (LPI).

Topics for discussion include current research on the establishment of permanent bases on the Moon and related space activities that may be pursued in the early 21st century. The broad topics to be addressed are scientific experimentation at a lunar base (such as astrophysics or human adaptation to 1/6 g), space technologies (including transportation, lunar surface infrastructure, utilization of lunar materials, and political and programmatic issues (such as public and private initiatives, international cooperation, legal concerns).

For additional information about the Second Symposium on Lunar Bases and Space Activities of the 21st Century, contact the Administrative Chairman:

Barney B. Roberts, III

Mail Code: ED13

NASA/Johnson Space Center

Houston TX 77058

Telephone: 713-483-6605

or the Technical Program Chairman:

Dr. Wendell W. Mendell

Mail code: SN3

NASA/Johnson Space Center

Houston TX 77058

Telephone: 713-483-5064

## **AMLAMP Announces Map Set**

The Antarctic Meteorite Location and Mapping Project (AMLAMP) is announcing the availability of a set of meteorite location maps for several Antarctic icefields. The maps display local geographic features such as ice/firn boundaries, moraine boundaries, and escarpments as well as meteorite and survey station locations. The icefields covered by the maps, map scales, and number of sheets per map are shown below.

Icefield	Scale	Sheets
Allan Hills Near Western	1:12500	1
Allan Hills Middle Western	1:25000	1
Allan Hills Far Western	1:25000	2
Elephant Moraine	1:12500	1

The goal of AMLAMP is to compile and maintain a database on Antarctic meteorites and to produce maps of their locations. The database information is obtained from the Meteorite Working Group and is current through the 1985-86 collection season. Existing maps will be updated periodically as additional information is acquired and new maps will be added to the set as information from other icefields is received. Announcements will be made as new or updated maps become available.

If you would like to order this map set direct your request to:

AMLAMP  
Lunar and Planetary Institute  
3303 NASA Road I  
Houston TX 77058-4399



Please include \$5.00 (\$8.00 outside USA) for each map set ordered to cover postage and handling charges. Maps will be sent in mailing tubes.



## MEVTV ORGANIZATIONAL MEETING HELD

On Sunday, March 15, the organizational meeting for the new NASA-sponsored LPI study project entitled *Mars: Evolution of Volcanism, Tectonism and Volatiles* (MEVTV) was held at LPI. The MEVTV study project will follow the successful format used during the previous three years in the MECA (*Mars: Evolution of its Climate and Atmosphere*) study project. Earlier this year, twenty-five research proposals received funding support from NASA as part of the MEVTV project and the organizational meeting provided the first opportunity for the Principal Investigators, along with other interested researchers, to discuss the activities and goals of the study project. Forty-two people participated in the organizational meeting.

The diversity of backgrounds and research interests represented by the attendees indicated a great potential for collaborative efforts during the three-year duration of the MEVTV project. However, the diversity of backgrounds also pointed out the need for a concerted effort at familiarizing all of the project participants with the working hypotheses derived from current research related to the MEVTV topics. As a step toward addressing this need, it was decided that the first MEVTV workshop should be centered around an assessment of our present understanding of the composition and distribution of materials on Mars, with an emphasis on establishing what "evidence" is used in making various inferences about the Martian surface. The title chosen for this first workshop is ***Nature and Composition of Surface Units on Mars in Space and Time***. A MEVTV Steering Committee was established, consisting of Sean Solomon (chairman), Ron Greeley, Don Turcotte, John Adams, Jim Head, Mike Carr, Kevin Burke, Jim Zimbelman, Pam Jones, and Joe Boyce.

The Steering Committee met on Tuesday, March 17, and it was decided that the first workshop will be held in the

San Francisco area on December 4 and 5, 1987, prior to the Fall American Geophysical Union meeting. Specific discussion topics will include the SNC meteorites, spectral measurements, constraints provided by photogeologic analyses, and weathering of Martian materials. Each topic will be introduced by a tutorial review, followed by discussion of questions and unresolved problems.

The MEVTV study project is open to participation by anyone interested in research related to topics encompassed by the project. For information about either the December workshop or participation in future MEVTV activities, contact the LPI Projects Office either by telephone (713-486-2150) or by mail.

Jim Zimbelman  
Lunar and Planetary Institute

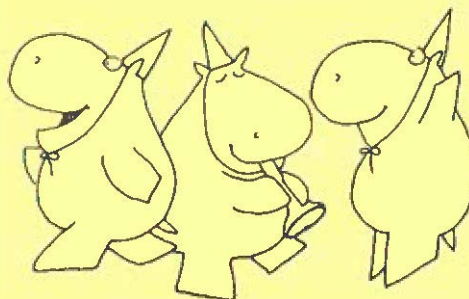
## MARS SAMPLE RETURN SCIENCE WORKSHOP

As a contribution to the Mars-Rover-Sample Return Science Working Group (MRSR SWG) activities, the Lunar and Planetary Sample Team (LAPST) is convening a workshop on the scientific questions to be addressed by the landing of spacecraft on Mars and the return of samples from Mars, the nature of the samples necessary to address the scientific questions, and the constraints on mission design so imposed. The workshop will focus on the sample return aspects of the mission. Science questions associated with instruments deployed in orbit and on Mars which are not directly related to the returned samples will be the subject of another workshop.

Conveners of the workshop are:

Michael J. Drake, University of Arizona	(602) 621-6952
Ronald Greeley, Arizona State University	(602) 965-7045
Gordon McKay, NASA Johnson Space Center	(713) 483-5041

The workshop will be held at the Lunar and Planetary Institute, Houston, Texas, on November 16-18, 1987. Attendance will be by invitation only and will be limited to about 60 participants. Those wishing to participate should send a letter of intent by June 1, 1987 to the LPI Projects Office. For a copy of the letter form contact Projects Office 713-486-2150; E-MAIL: NASA/SPAN LPI:Project.





## **SPACEWEEK '87— CHARTING OUR FUTURE IN SPACE**

The U.S. space program today is at a watershed and even its more ardent supporters face a stiff challenge in recapturing the spirit and enthusiasm that once characterized the program, says a space program engineer and the president of a national organization that each year coordinates scores of pro-space events in more than 75 cities.

"Many space supporters believe the United States' future leadership in space is inevitable. It isn't," says Dennis Stone, president of Spaceweek National Headquarters, based in Houston. Spaceweek has announced its theme for 1987: *Charting Our Future in Space*, and Stone is now rallying supporters and sponsors to host events during the 1987 anniversary of the first lunar landing mission, July 16-24.

During Spaceweek '87 and throughout the year, Stone hopes to create and encourage scores of public forums on the future of the U.S. space program. "This is a critical issue that needs to be addressed by individuals and corporations, by civic groups and Congressional committees, by scientists and school children."

Individuals and organizations which support the space program are invited to arrange events or participate by contacting Spaceweek National Headquarters, P.O. Box 58172, Houston Texas 77258. Contact Lisa Ehrler 713-332-4968 or Roger Grape 713-271-5000.

## **NEW PUBLICATIONS**



Some of 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.

Some of the NASA documents cited here are only available from the National Technical Information Service, Springfield VA 22161. This agency also requires prepayment.

It should also be noted that the paper copy supplied by this agency is often a photocopy produced from a microfilm. Consequently quality is not always consistent.

**PLEASE** do not send orders for these publications to the LPI. We are not a distribution center for SOD or NTIS documents and this will only delay your order. If you are interested in obtaining any of the items in the **New Publications List** do contact the publisher or supplier listed with each item.

## **NASA PUBLICATIONS**

### ***How We Get Pictures From Space***

This 11-page booklet is in the NASA Facts series of educational publications (NF-151/8-86). The easily understandable text written by Robert Haynes explains how images can be obtained through space probes or ground-based observations. A two-page chart titled "Brief History of Pictures by Unmanned Spacecraft" which lists the missions dating from the Ranger mission to Voyager 2 giving date, the target planet, and the number of pictures obtained from each mission, is worth the \$1.00 being charged by the Superintendent of Documents.

### ***Status and Future of Lunar Geoscience***

An overview of where we are now in our study of the Moon and where we should proceed in these studies is presented in this NASA SP-484. Compiled by the Lunar Geoscience Working Group, P.D. Spudis, chairman, the 54-page publication answers the questions of why we study the Moon and where we are in this study, outlines the status of unresolved problems in lunar science, and proposes a future for lunar science to include the establishment of a lunar base. The publication contains several diagrams and photographs plus a rather extensive bibliography (7 pages). Certainly a useful document to answer the question "What good is the Moon?" Available from the Superintendent of Documents for \$4.25.

### ***Space Mathematics***

High school mathematics teachers have long been aware that their students should know not only something about the development of pure mathematics but also something about its application. Several years ago NASA, recognizing the appeal of aerospace activities, initiated and supported the development of curriculum supplements for several high school courses. Because attainments in aerospace would not be possible without mathematics, it was most appropriate that a supplementary publication dealing with space activities be prepared for teachers of mathematics. Working problems such as those in this book should enhance both the mathematical knowledge and skills of students and their appreciation and understanding of aerospace technology and achievements. Teachers of mathematics, like most adults in today's world, can hardly fail to be aware of the rapid development of space science. NASA realizes that the

spectacular achievements of the space program have depended heavily on mathematics. . . mathematics that is generally complex, advanced, and well beyond the level of most secondary school curricula. Even though this perception is valid, there are many significant aspects of space science that can be understood using only high school mathematics. This 192-page publication, published in a paper-back edition for \$8.50 is available from Superintendent of Documents.

### ***Selections from the NASA Art Collection***

This is a set of twelve 11x14 selections from the NASA Art Collection suitable for bulletin board or for framing. Since 1962, NASA has commissioned some of the nation's outstanding artists to render their impressions of key events in the United States' space program. Artists have been at Kennedy Space Center as astronauts suited up for their flights. They were at Mission Control in Houston during the first Moon landing and aboard recovery ships when astronauts returned to Earth. They have depicted Shuttle launches and landings, flight tests of experimental aircraft, space science satellites, deep space probes and tracking and data transmission systems. At a cost of \$6.00 for this set of 12 reproductions, the set is a real bargain. Available from the Superintendent of Documents.

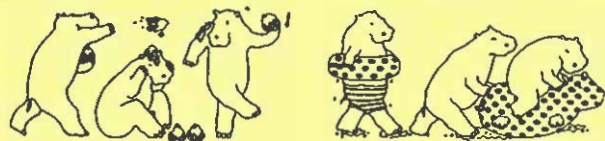
### **Other Publications of Special Interest to Educators**

#### ***MMI Corporation - New Catalog***

A buyer's guide to a variety of products available from MMI in the fields of Astronomy and Space Science this new catalog lists hundreds of color slides, videocassettes, filmstrips, globes, models, observing aids, and manuals plus MMI's 8600 and 8800 portable school planetariums. Also included in this guide is MMI's Advanced Laserdisc System for Astronomy and Space Science. If you teach physics, earth science, or the geological sciences this can be a very useful resource tool. Write MMI Corporation, 2950 Wyman Parkway, P.O. Box 19907, Baltimore MD 21211 (301-366-1222) and request copy of catalog no. 8720.

#### ***Space is the Place***

This is a children's activity workbook for grades 1, 2, and 3. It includes anagrams, pictures to color, matching word concepts all aimed at teaching the elementary student about the space program. Since there are not many materials directed to this age level, this should be a very useful tool for the primary school teacher. It is available from NASA Facts, 10064 Grandview Drive, La Mesa CA 92041. Please send check for \$3.50 (includes tax, shipping and handling fee).



## **From Astronomical Society of the Pacific**

### ***Splendors of the Universe Slide Set***

A set of 15 magnificent color slides by an astronomer whom many consider the finest celestial photographer of our time has just been released by ASP. The set highlights the work of Dr. David Malin, who has used the largest telescope in Australia and a host of modern photographic techniques to capture the beauty of some of the most interesting objects in the heavens.

Among the brilliant color images included in the set are the Orion Nebula, the Helix Nebula, and the Eta Carinae Nebula. The slides are accompanied by a 16-page booklet by Dr. Malin which includes detailed *nontechnical* captions (designed to explain the significance of each slide), background material on astronomy for beginners, an introduction to his techniques of astrophotography, and a reading list.

To preserve the exquisite detail and color balance in these slides, each one was individually produced directly from the masters provided by Dr. Malin. These slide versions, therefore, are able to present precise colors and subtle features that posters or printed reproductions cannot match. The set is available from ASP for \$18.95 (outside U.S. add \$3.00; California residents please add sales tax).

### ***Infra-red Universe Slide Set***

A set of 25 color slides from the recent pioneering Infra-Red Astronomical Satellite (IRAS) is also a new release from ASP. During its 10-month life, IRAS gave astronomers the clearest and most detailed view of the infra-red universe ever obtained.

Assembled for the Society by IRAS Project Scientist Charles Beichman, the set includes views of the center of the Milky Way, the disk around the star Beta Pictoris, the star-forming regions of Orion, an all-sky map of infra-red sources, Comet IRAS-Araki-Alcock, the peculiar infra-red galaxy Arp 220, and more. A 16-page nontechnical booklet setting out the background of the project and giving detailed captions for each slide accompanies the set.

To obtain a copy send \$21.95 (outside U.S. add \$3.00; California residents please add sales tax) and mail order to ASP.

The address for the Astronomical Society of the Pacific is:

A.S.P.  
IRAS (or MALIN SLIDES) DEPT.  
1290 24th Avenue  
San Francisco CA 94122



These slide sets are among many educational materials released by the 98-year old Society to enhance the public understanding of science. A free catalog is available from the Catalog Department at the above address.

## New Books from Various Publishers

### ***The Book of the Moon by Thomas A. Hockey***

This book presents a fascinating, non-technical review of man's views of the moon from early folklore through the Apollo missions to future settlements on the lunar surface. It could be read profitably by interested high school students and adults who are curious about the influence of the moon on the evolution of human thought. There are many short, thought-provoking anecdotes about the historical importance of the moon in the early development of agriculture, the calendar, medicine, etc. that could make this a useful resource book for teachers at any level.

The first five chapters (108 pages) bring us up to the 20th century. Starting with a section on the role of the moon as a deity in ancient Sumeria, Babylon, Egypt, Greece and Rome, there follows a rather detailed description of the moon's motions with the appropriate terminology for phases, months, nodes, and eclipses. The description of motions leads logically into the difficulties that attended the development of a calendar that would include both lunar and solar cycles. Reactions to eclipses and their predictions and the ancient explanations of the moon's motions provide several pages of fascinating stories. The entire fourth chapter is devoted to the increasingly more precise measurements that led to the advances in our knowledge of the moon's motions and the nature of its surface features. The pretelescopic advances of Copernicus, Tycho, and Kepler are outlined and culminate with Kepler's three laws of planetary motion. Following brief descriptions of Galileo's early observations of the moon with a telescope we are introduced to the maps produced by Harriot, Langrenus, Hevelius, Divini, and Grimaldi in 1600-1650. Descriptions of lunar surface features are generally illustrated by photos. The fifth chapter concludes the evolution of thought on lunar motions and their effects by introducing Newton's Laws. A segment on lunar surface temperature and atmosphere is made rather entertaining by anecdotes about weather and life on the moon. The chapter concludes with a very readable section on the longstanding debate over the volcanic vs. impact origin of the moon's craters.

The next three chapters (p.110- 214) cover Apollo and its precursor missions and what was learned from them. From a story written by Cyrano de Bergerac in 1656 about a man who goes to the moon in a chair with rockets strapped to it, we are led through the more relevant early development of rockets (Tsiolkovsky, Goddard, and Oberth) to the beginnings of the U. S. space program and President Kennedy's pronouncement in 1961 that we would land a man on the moon "before the decade is out". The successes and disappointments of the manned Mercury and Gemini programs and of the unmanned Ranger, Surveyor, and Lunar Orbiter programs are all presented as the necessary precursors for the Apollo missions.

The chapter devoted to the Apollo missions starts with the fatal fire in the Apollo 1 spacecraft in January 1967. Each Apollo mission from Apollo VII to XVII is then described in

some detail to include objectives, some flight details, problems, and interesting personal or historical tidbits. Chapter eight is devoted to the discoveries in lunar science made as a result of the Apollo missions. These discoveries resulted from the combined use of the instruments left on the moon to provide geophysical data and the rock and soil samples returned to Earth for detailed analysis. Included are discussions of the origin of the lunar regolith, ages of lunar samples, evidence for volcanism, internal structure, thermal history, magnetic history, and implications of the moon's bulk chemical composition. The final section of this chapter contains a very good summary of the status of various hypotheses for the origin of the moon including the currently fashionable impact of a Mars-size body into the Earth.

The final chapter (36 pages) presents some post-Apollo plans. After a brief review of the ups and downs of interest in a lunar polar orbiter during the 1970's and 80's the last 20 pages are devoted to the current plans for a major effort to return to the moon through the establishment of a permanently manned lunar base.

The book is completed with a useful 23 pages of glossary, bibliography and index.

Overall the book is quite readable and even entertaining. A few sections are a bit more detailed than others and require substantial concentration if one is to fully appreciate the discussion: e.g., the section on the moon's motions and associated terminology of phases, cycles, and nodes. There are a few nagging typographical errors and a few factual errors or misconceptions that would have been easily spotted if reviewed by a lunar scientist prior to publication. Following are a few obvious examples of the latter. 1) In a discussion of lunar soil and cosmogenically produced rare gases appears the statement "The fines have been implanted there by the solar wind and cosmic rays." The remainder of the discussion shows that the author is not aware that the term "fines" refers to the fine grained fraction of the soil into which the cosmogenically produced gases are implanted. 2) In a discussion of isotopic age dating by the rubidium-strontium method it is stated that there was no  $^{87}\text{Sr}$  there to begin with and all of it is produced by decay of  $^{87}\text{Rb}$  to provide the age of the rock. The author is unaware that there is a substantial amount of  $^{87}\text{Sr}$  present at the time of formation of a rock and the determination of that initial amount is one of the crucial parameters in dating rocks. 3) In a discussion of the lunar rock that occurs as an Antarctic meteorite appears the statement the lunar meteorite "contains minerals that are not found in the Apollo samples". This is not true; there are no such minerals reported. What may have confused the author is the fact that a few of the rock fragments that are present in the meteorite have chemical compositions that extend a bit beyond the range of those in the Apollo collection. But they are not new minerals which is a significant difference.

A couple of other minor errors that could have been avoided involve the use of inaccurate terminology. The author mentions that the lunar samples are housed in the Lunar Receiving Laboratory (LRL) at the Johnson Space Center. In

fact, all of the lunar samples were moved from the LRL to the Lunar Sample Building in 1973 and 1974. The Lunar Receiving Laboratory no longer exists. In another instance the author mentions that "funding cutbacks curtailed the opening of new sample boxes". It is some of the core tubes that were driven into the lunar soil by the astronauts that have not been opened.

Aside from these few complaints I found the book to be interesting and easy to read. It fits well with the author's own description in the preface: "a brief, nontechnical review of humanity's affair with the Moon for those who have an 'armchair' curiosity about science and about history".

The book is published by Prentice Hall Press, New York, \$14.95.

Reviewed by W.C. Phinney NASA/Johnson Space Center

### ***Lunar Entrepreneurs Directory***

"This first edition of the *Lunar Entrepreneurs Directory* is designed to serve as a communications vehicle for the acceleration of activities leading to an early and permanent Return to the Moon by Americans and other individuals. Those included as Lunar Entrepreneurs were recommended because of their participation in recent symposia, particularly the 1984 NASA Lunar Base Symposium held at the National Academy of Sciences in Washington DC and the 1986 Lunar/Mag-Lev Symposium held in Atlantic City NJ. Others are notable for sponsorship or performance of research and development activities oriented towards lunar enterprise. The most important are those who are advancing seriously towards the real development of profitable lunar ventures". (page 1, the Directory).

This 12-page directory of names, addresses and phone numbers of some 500 people carries a rather hefty price tag of \$50.00. As with any directory it has the problem that it is out of date the moment it is printed because of the mobility of many of the people involved in lunar science. Its usefulness could be expanded if there was an index by location and/or institution. The telephone directory style (with some comments) is most useful only if you know the people you are trying to reach.

Since Space Age Publishing Company, the publisher of this directory and several other publications such as *Space Daily* and *Space Calendar*, calls this a first edition, we can hope that some of the address errors and typos will be eliminated in the next edition.

Orders for the Directory should be prepaid. Rates: \$50 single copy (\$30 for 2nd copy); \$25 special single copy rate to validated Space Calendar subscribers (\$20 for 2nd copy); 1st copy free to Space Daily subscribers. Send orders to: Space Age Publishing Company, 3210 Scott Blvd., Santa Clara CA 95054-0975.

### ***Asteroid Photometric Catalogue***

This book, by C.-I. Lagerkvist, M.A. Barucci, M.T. Capria, M. Fulchignoni, L. Guerriero, E. Perozze and V. Zappala, contains photometric lightcurves and related information for

the 357 asteroids whose observations have been published up to 1985. It is planned to update the catalogue every two years. The volume is presented in loose-leaf form to facilitate both updating and the rearrangement of sheets according to the user's preferred scheme of classification. The current volume consists of 1164 pages. Orders should be sent to:

CNR (Consiglio Nazionale Delle Ricerche)  
Servizio Pubblicazioni  
Piazzale A. Moro, 7  
00185 Roma, Italy

The price in Italy is L.70.000 plus mail expenses or \$70 for foreign countries.

### **New Slide Set from LPI**

#### ***Shuttle Views the Earth: the Oceans from Space***

Oceanographers were surprised at how much information was contained in the earliest photographs from space. For example, Gemini photographs of the Gulf of Mexico revealed the spawning grounds and migration habits of the gulf shrimp. This previously unknown information was of great benefit to the Gulf fishing fleet.

Since that time, all NASA astronauts have been briefed in oceanography and the first Shuttle mission in 1981 discovered spiral eddies in the Gulf of Oman. At the time, these were thought to be an isolated phenomenon but subsequent Shuttle studies revealed similar eddies in many locations around the globe. The volume of new information about earth's oceans supplied by the natural color photography brought back by Shuttle crews led to the inclusion of oceanographer Paul Scully Power in the crew for Mission 41-G in May 1984. His observations and analysis of the photographs brought back from space by Shuttle crews have contributed a wealth of new information to our understanding of ocean dynamics. A selection of the most fascinating and informative photographs are included in this slide set.

Some of the features covered include:

- oblique photographs taken in sunglint which reveal the dynamic nature of the oceans.
- shears and spiral eddy features, extending several kilometers
- the cycle of atoll building followed by erosion and ultimate disappearance
- pollution created by oil tankers at sea, sluicing their tanks
- dynamics of ship wakes
- island wakes which interrupt ocean dynamics
- movement of river sediments along the coast
- the marks left by hurricanes on the ocean floor

This slide set consisting of 40 slides and an explanatory booklet will be available from the LPI Order Department after July 1, 1987. Cost will be \$15.00 if mailed in the U.S.; \$20.00 if mailed to foreign countries.

## LPI'S FIRST UREY VISITING FELLOW

Professor Harold C. Urey was awarded the Nobel prize for chemistry in 1934 for his discovery of the heavy form of hydrogen known as deuterium. He made fundamental contributions to a widely accepted theory of the origin of the Earth and other planets and in 1952 published his theories in *The Planets: Their Origin and Development*. In the early 1960's he made recommendations for space exploration and later contributed to the study of the lunar surface. Dr. Urey was in residence at the Lunar Science Institute (the LPI today) during the early 1970's. A symposium honoring his 80th birthday was held in April 1973.

A new, short-term senior appointment to be known as a Urey Visiting Fellow has been established at the Lunar and Planetary Institute. Dr. Richard A. F. Grieve of the Geophysics Division of the Geological Survey of Canada is the first Urey Fellow. While at the Institute from April 22-May 15, Dr. Grieve will be working on a number of projects including: cratering experiments to study scaling relations and waste heat losses; a workbook on craters for use by astronauts in the Earth Observation Program; a slide collection on cratering phenomena; an examination of multispectral signatures of some Australian craters.

The position was established based on the idea that interaction with a distinguished scientist who has the opportunity to pursue his research interests while a visitor will be beneficial to scientists both at the LPI and at JSC, and strongly further the research interests of the Solar System Exploration programs of NASA. The LPI hopes that about one such appointment a year will be possible, subject to availability within existing funding.

## ELECTRONIC MAIL SURVEY

**SPAN. . . BITNET. . . OMNET. . . ARPANET.  
. . . AND ON AND ON AND ON. . . NET**

With the advent of various computer networks which are providing a variety of electronic mail facilities, bulletin boards, etc., have you ever wondered just how you could use them for communication? How does one find out the network, node name, and account name of a colleague so that the electronic mail message could be sent?

The Lunar and Planetary Institute hopes to be able to answer some of those questions by compiling a listing of electronic mail addresses from the scientific community. If you are willing to have your name included in this list, please complete the following form and return it to Carolyn Kohring at the LPI. Ms. Kohring is also compiling a document listing access codes from one network to another. If you are interested in obtaining a copy of this networking document, please contact her. (713-486-2192; NASA/SPAN LPI:KOHRLNG.)

LUNAR AND PLANETARY INSTITUTE  
ELECTRONIC MAIL SURVEY

The Lunar and Planetary Institute wishes to compile a list of electronic mail addresses from the scientific community. If you are willing to have your name included in this list, please complete the following and return it to C. Kohring, LPI, 3303 NASA Road One, Houston TX 77058-4399.



## LUNAR AND PLANETARY INSTITUTE ELECTRONIC MAIL SURVEY

Name \_\_\_\_\_ Telephone Number \_\_\_\_\_

Institution \_\_\_\_\_

Electronic Mail Address (Telemail, Mail, Omnet, etc). \_\_\_\_\_

Computer Network \_\_\_\_\_ Node Name \_\_\_\_\_ Account Name \_\_\_\_\_

Computer Network \_\_\_\_\_ Node Name \_\_\_\_\_ Account Name \_\_\_\_\_

Computer Network \_\_\_\_\_ Node Name \_\_\_\_\_ Account Name \_\_\_\_\_

**NOTE TO OUR READERS:**

**PLEASE** let us know when you move. Each change of address which we get through the postal service costs us \$.30-\$.80 in return postage costs. Because of the high costs of postage, we will make the address change on our list but we will no longer mail another copy of the LPIB issue or whatever was contained in the envelope that we get back. Since the same mailing list is used for conference announcements and other LPI mailings you will miss whatever is mailed from the LPI in the interval that we do not have your address change.

If you want to be sure that you get all of your mailings from the Institute promptly, be sure to send a change of address to: Mailist, Lunar & Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. It often takes the postal service 60-90 days to return an item to us with the address correction. We also often receive a notice on the returned envelope that the "forwarding order" is expired. Under that circumstance, we have no alternative than to delete the name from the mailing list. Do yourself and us a service. Remember the LPI Mailing List when you move. Thanks.

*ye editor*

The **LUNAR AND PLANETARY INFORMATION BULLETIN** is published by the Lunar and Planetary Institute. There are usually three 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 NOVEMBER. Copy deadline is OCTOBER 5, 1987. 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: Frances B. Waranius  
Lunar and Planetary Institute  
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Houston, TX 77058-4399  
EMAIL: NASA/SPAN LPI:BULLETIN  
TELEMAIL: [FWARANIUS/NASA]  
Phone: 713/486-2135



# CALENDAR



## 1987

May 18-22	<b>American Geophysical Union Spring Meeting</b> , Baltimore, Maryland.	American Geophysical Union Spring Meeting 2000 Florida Avenue NW Washington Dc 20009 Phone: 202-462-6903
May 19-21	<b>AIAA/JPL International Conference on Solar System Exploration</b> , Pasadena, California.	American Institute of Aeronautics & Astronautics 1633 Broadway New York NY 10019
June 7-9	<b>1987 Houston Space and Telecomm Symposium</b> , Houston, Texas.	Space and Telecomm, Inc. P.O. Box 230192 Houston TX 77223 Phone: 713-225-1950
June 8-10	<b>Twelfth Symposium on Antarctic Meteorites</b> , National Institute of Polar Research, Tokyo, Japan.	Tatsuro Matsuda, Director-General National Institute of Polar Research 9-10 Kaga 1-Chome, Itabashi-Ku Tokyo 173 Japan Phone: (03)962-4711 - 4716

June 14-18	<b>170th Meeting of the American Astronomical Society,</b> Vancouver, British Columbia.	Harvey Richer Dept. of Geophysics and Astronomy University of British Columbia Vancouver BC V6T 1W5 Canada Phone: 604-228-4134
June 16-18	<b>Uranus Conference,</b> Pasadena, California.	Jay T. Bergstralh, Organizer Mail Stop 183-301 Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena CA 91109 Phone: 818-354-2296
June 20-21	<b>Working in Orbit and Beyond: the Challenges for Space Medicine,</b> OMNI Shoreham Hotel, Washington, DC.	Office of Continuing Medical Education Georgetown University Medical Center 3800 Reservoir Road NW Washington DC 20007 Phone: 202-625-2306
June 20-24	<b>Contribution of Amateur Astronomers to Astronomy,</b> Paris, France.	P. Simon Societe Astronomique de France 3, Rue Beethoven 75016 Paris, France Phone: 224.13.74
June 21-26	<b>Space Life Sciences Symposium: Three Decades of Life Science Research in Space,</b> OMNI Shoreham Hotel, Washington DC.	Baylor College of Medicine Office of Continuing Education Space Life Sciences Symposium One Baylor Plaza Houston TX 77030
June 23-25	<b>Space Research '87: Results and Status of Low-Gravity Research,</b> Marriott Marquis Hotel, New York City.	Media Dimensions Inc. 42 E. 23rd Street New York NY 10010 Phone: 212-522-7481, -7483,-3943
July 6-10	International Workshop <b>Cryptoexplosions and Catastrophes in the Geological Record,</b> Parys, South Africa	Organising Committee Cryptoexplosions Workshop Bernard Price Institute of Geophysical Research University of the Witwatersrand 1 Jan Smuts Avenue Johannesburg 2001 South Africa
July 6-11	<b>Continental and Oceanic Lithosphere: Similarities and Differences,</b> University of London, Royal Holloway and Bedford New College, England.	Steve Bergman Arco Exploration and Technology Corp. 2300 West Plano Pkwy. Plano TX 75075 Phone: 214-422-6264

July 13-17	<b>Workshop on the Growth of Continental Crust</b> , Oxford University, England.	Pam Jones Lunar and Planetary Institute 3303 NASA Road One Houston TX 77058-4399 Phone: 713-486-2150
July 14-16	<b>99th Annual Meeting of the Astronomical Society of the Pacific, "Cool Stars and Galactic Structure"</b> , Pomona College, Claremont, California.	Summer Meeting A.S.P. 1290 24th Avenue San Francisco CA 94122 Phone: 415-661-8660
July 15-16	<b>Solar System—Chemical Clues to Its Origin</b> , Royal Society of London, England.	Miss C.A. Johnson The Royal Society 6 Carlton House Terrace London SW1Y 5AG England
July 16-24	<b>SPACEWEEK</b>	Spaceweek National Headquarters P.O. Box 58172 Houston TX 77258 Phone: Lisa Ehrlar 713-332-4968 or Roger Grape 713-271-5000
July 18-22	<b>Case for Mars III: Strategies for Exploration</b> , Boulder, Colorado.	Case for Mars III P.O. Box 4877 Boulder CO 80306 Phone: 303-494-8144
July 20-24	<b>50th Annual Meeting of the Meteoritical Society</b> , Newcastle upon Tyne, England.	Dr. D.W. Collinson School of Physics The University Newcastle upon Tyne NE1 7RU England Phone: 091-232-8511
August 9-22	<b>XIXth General Assembly of the International Union of Geodesy and Geophysics</b> , Vancouver, British Columbia, Canada	Conference Secretariat c/o Venue West #801 - 750 Jervis Street Vancouver, B.C., Canada V6E 2A9
August 9-22	<b>Interdisciplinary Symposium 10 - Comparative Planetology - Sputnik Commemorative Symposium</b> , Vancouver, British Columbia, Canada	Dr. James W. Head III Department of Geological Sciences Brown University, Box 1846 Providence RI 02912 Phone: 401-863-2526
August 17-21	<b>7th International Conference on Basement Tectonics</b> , Queen's University, Kingston, Ontario, Canada.	7th International Conference on Basement Tectonics c/o Events Management Inc. 4 Cataraqui Street, Suite 209 Kingston Ontario Canada K7K 1Z7 Phone: 613-547-5093

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August 25-27	<b>International Workshop on Time-Variable Phenomena in the Jovian System</b> , Flagstaff, Arizona.	William A. Baum Lowell Observatory Mars Hill Road Flagstaff AZ 86001 Phone: 602-774-3358
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September 6-11	<b>15th Annual Meeting on Atmospheric Studies by Optical Methods (AMASOM)</b> , Granada, Spain.	Dr. J.J. Lopez-Moreno Instituto de Astrofísica de Andalucía P.O. Box 2144 18080 Granada Spain Phone: 12 1300
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September 10-27	<b>Evolution of Metamorphic Belts</b> , Department of Geology, University College, Dublin, Ireland.	J.S. Daly Department of Geology University College, Dublin Belfield, Dublin 4, Ireland
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September 14-16	<b>Origin of Granites</b> , Edinburgh, Scotland.	Meetings Secretary Royal Society of Edinburgh 22-24 George Street Edinburgh, Scotland EH2 2PQ
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October 10-17	<b>38th International Astronautical Congress</b> Brighton, U.K.	Mr. Dorio Melli American Express Destination Services Marketing 19/20 Berners Street London W1P 4AE England Telephone: 01-637-8600
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October 12-14	<b>Astronomy from Large Databases: Scientific Objectives and Methodological Approaches</b> , Garching-bei-Munchen, FRG.	F. Murtagh, ST-ECF Karl-Schwarzschild-Strasse 2 D-8046 Garching-bei-Munchen, FRG
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October 26-29	<b>100th Annual Meeting and Geoscience Exposition of the Geological Society of America</b> , Phoenix, Arizona.	Jean Kinney Geological Society of America P.O. Box 9140 Boulder CO 80301 Phone: 303-447-2020
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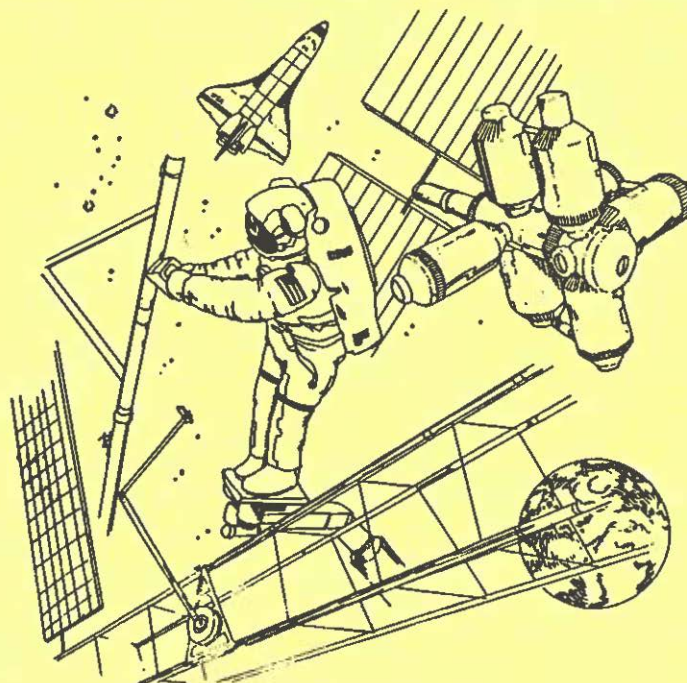
November 10-13	<b>American Astronomical Society, Division of Planetary Sciences Meeting</b> , Pasadena, California.	Kevin Baines Mail stop 183-301 Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena CA 91109 Phone: 818-354-0481
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November 16-18	<b>Mars Sample Return Science Workshop</b> , LPI, Houston, Texas.	Projects Office Lunar and Planetary Institute 3303 NASA Road One Houston TX 77058-4399 Phone: 713-486-2150
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| November 23-26 | <b>International Colloquium on the Coordination of Observational Projects</b> , Strasbourg, France. | C. Jaschek<br>Centre de Donnees Stellaires<br>11, Rue de l'Universite<br>67000 Strasbourg, France<br>Telephone: 88 35 82 20 |
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| November 24-27 | <b>Space &amp; Sea Colloquium</b> , Marseilles, France. | Mr. Y. Tixier<br>c/o AAAF Secretariat<br>80 rue Lauriston<br>75116 Paris, France<br>Phone: (33.1)47 04 80 68 |
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| December 4-5 | <b>MEVTV Workshop: Nature and Composition of Surface Units</b> , San Francisco, California. | Projects Office<br>Lunar and Planetary Institute<br>3303 NASA Road, One<br>Houston, TX 77058-4399<br>Phone: 713-486-2150 |
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| December 7-11 | <b>American Geophysical Union Fall Meeting</b> , San Francisco, California. | Fall Meeting<br>American Geophysical Union<br>2000 Florida Avenue NW<br>Washington DC 20009<br>Phone: 202-462-6903 |
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| December 11 | <b>Planetary Science</b> , Royal Astronomical Society, London. | F.W. Taylor<br>University of Oxford<br>Clarendon Laboratory<br>Parks Road<br>Oxford OX1 3PU England<br>Phone: 0865 272933 |
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## LUNAR AND PLANETARY BIBLIOGRAPHY

Items selected from materials received at the LPI Library Information Center. Address of first author is included as the last line of the reference when cited. Please contact the author or your library for a reprint or copy of an article. For literature searches on the on-line Lunar and Planetary Bibliography call the LPI 713-486-2191.

### THE MOON

ARNDT, J. + VON ENGELHARDT, W.  
FORMATION OF APOLLO 17 ORANGE AND BLACK GLASS BEADS  
PROCEEDINGS OF THE SEVENTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE, PART 1,  
JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 92, NO. B4, PAGES E372-E376  
MARCH 30, 1987

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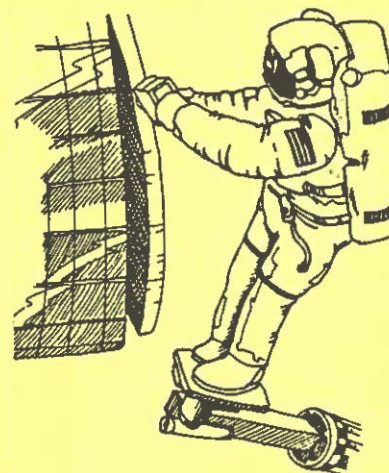
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