

LUNAR AND PLANETARY



# INFORMATION BULLETIN

FEBRUARY 1989 • NUMBER 52

## Lunar and Planetary Science Conference XX

The TWENTIETH LUNAR AND PLANETARY SCIENCE CONFERENCE will begin Sunday March 12 at 6:00 p.m. with registration and an open house at the Lunar and Planetary Institute. The pre-registration fee for the conference is \$40.00 for all attendees except students with Student ID's who may register for \$20.00; there will be a late fee of \$10.00 assessed for all registrations received after March 6, including those received during the conference. A shuttle bus will run between NASA-area hotels and the LPI from 5:45–10:00 p.m. Registration will continue throughout the conference on the 2nd floor of the Gilruth Center at the Johnson Space Center. All conference activities, technical sessions, exhibits, poster sessions, etc., unless otherwise listed, will be at the Gilruth Center.

From a total of 643 abstracts accepted for publication in *Lunar and Planetary Science XX*, the Program Committee has constructed 28 technical sessions and 1 special session. The general structure of the program is as follows:

### MONDAY AM, MARCH 13

- Mars Remote Sensing
- Chondrules and Ordinary Chondrites
- Cosmic Dust I

### MONDAY PM, MARCH 13

- Mars Remote Sensing/Volcanism
- Carbonaceous Chondrites
- Shock Metamorphism and Terrestrial Craters
- Planetary Differentiation (Bldg. 30 auditorium)

### TUESDAY AM, MARCH 14

- Mars Geology
- Bholghati and Angrite Consortia Plus Pallasesites
- Cosmic Dust II and Interstellar Grains/Dust



13-17 March 1989

### TUESDAY PM, MARCH 14

- Mars: Water, Canyons, and Life
- Ureilites, Ungrouped Chondrites and Nebular Processes
- Lunar Geology, Processes and Resources

### TUESDAY EVENING, MARCH 14

- NASA Opportunities in Solar System Exploration (Bldg. 2 auditorium)

### WEDNESDAY AM, MARCH 15

- Venus Geophysics
- CAIs
- Nature and Effects of Impact Cratering

### WEDNESDAY PM, MARCH 15, SPECIAL SESSION

- 20th Anniversary Plenary Review (Bldg. 2 auditorium)

### THURSDAY AM, MARCH 16

- Venus Geology
- SNCs, HEDs, and Fellow Travelers
- Regolith and Cosmic Rays

### THURSDAY PM, MARCH 16

- Origin and Crystallization of Mare Basalts and Asteroids and Small Bodies
- Chemical and Isotopic Characteristics of Solar System Material
- Planetary Physics

### FRIDAY AM, MARCH 17

- Magma Evolution in the Lunar Highlands
- Planetary Accretion
- Outer Solar System

The preliminary program included in this issue reflects plans for the conference as they exist early in February. Minor changes may yet occur before the Conference itself (see Appendix to this Bulletin)

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# Conference Highlights and Peripheral Meetings

*Posters* entered in the Technical Poster Session will be highlighted Monday, Tuesday, and Thursday of the Conference in the Gilruth Center. Approximately 30 posters will be displayed each day. Authors will be available for discussion from 5:00–6:30 p.m. on these days, during which time complimentary keg beer and soft drinks will be served.

The on-line and remote access capabilities of the interrelated database systems in use at the LPI will be displayed in the coffee area of the Gilruth center during regular conference hours. These databases include the Geophysical Data Facility (GDF) and the Bibliographic Search Service (BSS) developed and maintained by the LPI, as well as the Image Retrieval and Processing System (IRPS) sponsored by Washington University, which includes the Planetary Image and Cartography System (PICS) created by USGS Flagstaff.

The *Combined Publishers Exhibit* will be on display in the coffee area of the Gilruth Center from Monday through Friday noon. Several publishers have already indicated an intent to participate, including Annual Reviews, Inc., American Geophysical Union, Springer-Verlag, Taylor & Francis, Macmillan Trade Books, and The University of Arizona Press.

## Tuesday — March 14

There will be an evening session held in the Bldg. 2 auditorium entitled "NASA Opportunities in Solar System Exploration."

## Wednesday — March 15

A JSC Astronomer's Brownbag Lunch Club seminar will be held in the Conference Room (Room 193) of Building 31 at noon. Jim Oberg will be presenting a talk entitled "Soviet Shuttle Update."

The Planetary Meetings Steering Committee (PMSC) will hold a meeting at noon in the Blue Room of the LPI. Members of the committee should contact Pam Jones, LPI Projects Office, at 713-486-2150 for additional information.

There will be a banquet held this year at the South Shore Harbour Hotel and Conference Center. Tickets for the banquet are \$25 or \$15 for students. The speaker will be George Mueller, who was the Associate Administrator for Manned Space Flight at NASA Headquarters

during the Apollo era. The banquet begins at 7:00 and a cash bar will be open starting at 6:00. Shuttle service will be provided from the other area hotels to the South Shore Harbour Hotel.

## Thursday — March 16

The Lunar and Planetary Science Conference *Forum* convened by the PMSC will be held at noon in Room 104 of the Gilruth Center. The *Forum* provides a session where conference participants can openly express and discuss mutual concerns.

Suggestions for issues to be placed before the *Forum* are solicited. Questions, comments, and suggestions should be sent to the LPSC Forum, c/o LPI Projects Office, so that they can be included in the summary and agenda for the *Forum*.

The Planetary Society, in cooperation with NASA, is sponsoring a symposium entitled "Current Questions on Planetary Exploration." This event will be held from 8 to 10 p.m. in the Building 2 auditorium. The panelists will include Louis Friedman, James W. Head, Michael B. Duke, Valery Barsukov, Mikhail Marov, and Lev Mukhin. Attendance is free, but tickets must be obtained beforehand from the Planetary Society. To obtain tickets, please write to the Planetary Society, Re: Houston Event, 65 N. Catalina Ave., Pasadena, CA 91106 or call 818-793-5100.

# Abstracts

## Lunar and Planetary Science XX

A staple-bound copy of abstracts will be sent before the conference to the corresponding author of an abstract. No copies will be sent to foreign authors this year unless the author has prepaid for the cost of shipping. Due to time constraints in our printing schedule and to budgetary constraints on postage, a limited number of copies to the same institution will be mailed. It is suggested that these copies be shared among the author's colleagues.

Abstract volumes will be distributed to all conference attendees. For those who cannot attend the conference but wish to have the abstracts, a supply will be available after the conference at the cost of shipping and handling. Refer to the order form included in this Bulletin and mail with payment to the LPI Order Department.

# On-line 20th LPSC Program

To access the online program, use either the NASA/SPAN network, NASA NPSS (NASA Packet Switching System) access, or dial in direct. When using NASA/SPAN, the node name for the LPI VAX is **LPI**. Direct dial phone lines are 713-486-8214 or 713-486-9782.

When connection is made, use the following directions:

**USERNAME:** Program  
**PASSWORD:** LPI

You will then get the usual "welcome" to the system and a menu of options will be displayed.

## 20TH LPSC PROGRAM ONLINE

Select the routine you wish to use by entering its letter below

- A. AUTHOR/SPEAKER NAME
- B. SESSION
- C. TOPIC (TITLE KEYWORDS)
- G. QUIT (EXIT ROUTINE)

A series of menus and prompts will cue you to the appropriate way to access the various aspects of the program. We hope this innovative way of presenting the program to the community almost at the same time it is formed will assist you in planning your travel arrangements and other appointments that you may wish to make.

If you have difficulty in accessing the LPI computer, please contact Kinpong Leung, LPI Computer Systems Manager, at 713-486-2165, [KLEUNG/NASA] (on NASAMAIL), or LPI:LEUNG (on SPAN).

The **LUNAR AND PLANETARY INFORMATION BULLETIN** is published three times a year by the Lunar and Planetary Institute, 3303 NASA Road One, Houston, Texas, 77058-4399.

Fran Waranus, *Editor*.

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Copy deadline for the May issue of the *Bulletin* is April 17, 1989. Send information of announcements to be included to the LPI Publications Office, 3303 NASA Road One, Houston, TX 77058-4399.

# 19th Proceedings Ordering Information

Published by Cambridge University Press  
and the Lunar and Planetary Institute

The *Proceedings of the Nineteenth Lunar and Planetary Science Conference* is a volume of papers including original research and reviews of current interest in the planetary sciences. This book incorporates, but is not limited to, material from the Nineteenth Lunar and Planetary Science Conference held at the NASA Johnson Space Center, Houston, Texas, in March 1988. The LPSC has been convened annually since 1970, and is one of the most important forums for research in planetary science. It thus represents a broad spectrum of disciplines and interests.

This year's *Proceedings* are edited by Dr. Graham Ryder and Dr. Virgil L. Sharpton. Topics range from plans to build an inhabited lunar base, to tectonic processes on Venus, to the geochemical distinctions between the Earth and the Moon and how they might be used to determine the origin of the Moon, to the effect of impact events on the Earth. The volume also contains papers on meteorites, comets, cosmic dust, solar system geochemistry, geology and petrology of the Moon and other planets, and a large section on impact cratering studies. The *Proceedings* are considered a prestigious publication, and the papers comprising it are reviewed with the rigor of an academic journal.

This volume should be of interest to researchers and their graduate students in all lunar and planetary programs, particularly workers in petrology, geochemistry, geophysics, geology, and astronomy.

*Proceedings of the Nineteenth Lunar and Planetary Science Conference*  
Edited by Lunar and Planetary Institute/  
Graham Ryder and Virgil L. Sharpton  
ISBN 0-521-37409-X 784 pages  
\$100/65£  
Publication date: March 1989

Also available:  
*Proceedings of the Eighteenth Lunar and Planetary Science Conference*  
Edited by Lunar and Planetary Institute/  
Graham Ryder  
ISBN 0-521-35090-5 753 pages  
\$65/60£  
Published: March 1988

## Publication of 20th Proceedings

The *Proceedings of the Twentieth LPSC* will be published as a hard cover book and is planned to be a joint venture between the LPI and a major book publisher. Graham Ryder and Buck Sharpton have agreed to serve as co-editors and will be assisted by a team of distinguished associate editors.

The deadline for submission of manuscripts to the *Twentieth Proceedings* is **May 26, 1989**. Full information, including detailed instructions for prospective authors, will be available at the registration desk. Please contact LPI Publications at 713-486-2188 for more information.

## USRA Establishes New Initiatives Office

At the recently held Universities Space Research Association (USRA) Strategic Development retreat it became clear that a need exists for heightened public awareness and understanding of USRA and its national research centers. Partially in response to this situation, USRA has established a New Initiatives Office to be housed at the Lunar and Planetary Institute. To head this new office, Nancy Wood, former executive director of The Space Foundation, has been appointed to the post of Special Assistant to the President of USRA. One of her first responsibilities will be to enhance and expand the research capabilities of the USRA facilities in Houston, which include the LPI, the Division of Space Biomedicine, and the Universities Advanced Design Program. Ms. Wood comes to this position with a long history of interest in and involvement with the space program and related activities. For eight years she has directed the Space Business Roundtable and the fellowship programs of The Space Foundation. She serves on the executive committee of the 1000-member Houston Chapter of American Institute of Aeronautics and Astronautics. Her professional affiliations include Fellow of the British Interplanetary Society and Associate Fellow of AIAA, and membership in Women in Aerospace, American Astronautical Society, Planetary Society, and the Astronomical Society of the Pacific.

Wood will be ably assisted by the new Executive Secretary to the New Initiatives Office, Joan Wade, who brings a unique background to this position. Wade was formerly Executive Secretary to the Director of Research and Development and the Vice President of Engineering and Technology of Vetcro Gray, Inc. In addition, she has a professional background in government, as City Councilwoman of Nassau Bay for five years, Congressional Aide to a U.S. Senator, and office manager to a U.S. Representative. Her professional competence combines with an understanding of the requirements of international space research to make her a welcome addition to the USRA space research support staff.

The latest addition to the New Initiatives program is Beth Williams, who has been appointed by the LPI as Consultant to the Director's Office. Williams, who was married to the late astronaut C. C. Williams, has been an area resident for 25 years. Her function is to assist the LPI Director and the New Initiatives Office in developing local education programs and related tasks and increasing public awareness of the LPI as a whole. Her knowledge of the area as well as her wide-ranging circle of acquaintances serve to make her an excellent choice for this task.

Anyone desiring further information regarding the New Initiatives Office should contact Nancy Wood at 713-486-2196 or the LPI Director's Office at 713-486-2180.

# Meetings

## Microsymposium 9

The ninth in a series of small symposia organized under the auspices of the Brown University-V. I. Vernadsky Institute (ASUSSR) institution-to-institution agreement, and including representatives from the Institute of Space Research (IKI) and several other institutions of the Soviet Academy of Sciences, will be held at Brown University, March 20-22, 1989. The meeting is entitled "Recent Scientific Results and Future Plans in the Exploration of the Solar System (Microsymposium 9)" and the co-conveners are V. L. Barsukov and James W. Head. Topics will include:

### Venus Volcanism: Processes and Deposits

Volcanism is clearly an important process on Venus, but how does it manifest itself, what is its contribution to heat loss, what are the rates of volcanism today, what are the implications of volcanism for geochemical cycles of volatiles, and where does Venus display presently active volcanism?

### Venus Tectonics and Interior Dynamics

Data from Venera 15/16 and other sources revealed a wide variety of tectonic deformation, and previous discussions have focused on several possible mechanisms for interior dynamics and surface deformation (hot spots, spreading, conduction, convection, etc.). In this session, attention will be focused on the nature of surface deformation and how it may be linked to the nature and dynamics of the interior of Venus.

### Venus Science: A Pre-Magellan View

Magellan will be launched in April 1989 and will begin returning data in 1990. The purpose of this discussion session is to outline the significant questions that the global high-resolution data from Magellan will help resolve. Emphasis will be placed on what we have learned from Venera, Pioneer-Venus, Arecibo/Goldstone, and other data, and how the analysis of these data have focused our attention on specific problems to be tested by Magellan Mission results.

### Scientific Problems and Objectives for Lunar Exploration

The Moon is the cornerstone for our understanding of processes in the early history of the solar system. Scientific attention is again focusing on the Moon with Galileo encounters in 1990 and 1992, and interest on the part of the U.S.S.R. and the U.S. in missions to the Moon in the 1990s. This session will focus on recent data and scientific questions for future missions.

### Nature, Origin, and Evolution of Phobos: The Pre-Encounter View

The Phobos Mission will encounter Phobos this spring, and this session will offer an opportunity to summarize existing knowledge about Phobos and to discuss the important questions that the mission will help resolve. Several Soviet and French investigators and Phobos IDSs will participate.

### Mars Stratigraphy, History, and Science Objectives for Future Exploration

The recent opposition of Mars and the Phobos Mission offer new regional data for the surface of Mars. This session will emphasize recent scientific results and the scientific questions associated with future Mars exploration, including possible sample return missions. The theme of this session will be the stratigraphy of Mars, the history of reservoirs of fine-grained material and volatiles, the important scientific questions relating to the major stages in the atmospheric and geologic evolution of Mars, and recent Soviet thinking on the biological evolution of Mars.

For more information on this meeting, please contact Jim Head at 401-863-2526 or Angel Hilliard at 401-863-2436.

## Lunar Polar Probe Conference Scheduled Prior to LPSC

The Houston Space Society is planning the Lunar Polar Probe Conference to be held in Houston on March 11 and 12, the two days immediately preceding the 20th LPSC. The conference is intended to formalize plans for the development, funding, and launch of a small satellite to explore the polar regions of the Moon. The weekend conference will be held at the Nassau Bay Hilton, located across the street from the LPI and the Johnson Space Center. Attendance is open to members of the general public with an interest in space, and the registration fee is \$15. A banquet will be held on Saturday, March 11, and the cost for attending is \$25 per person. Guest speakers at the conference will include Dr. Wendell Mendell of the NASA Johnson Space Center. General information will be discussed in a series of panels on Saturday followed by workshop sessions and a press conference on Sunday. More information on the conference may be obtained from Howard Stringer (713-783-1181) or James Davidson (713-643-6373), or by writing the Houston Space Society at P.O. Box 266151, Houston, TX 77207-6151.

## International Congress to Draw Top Earth Scientists to U.S.

An international gathering of over 6000 earth scientists will convene in Washington, D.C., during July 1989 for the prestigious 28th International Geological Congress. The IGC provides a forum for the world's foremost geoscientists to present state-of-the-art findings and exchange ideas on topics ranging from research on earthquakes and volcanoes to the recovery of oil and water.

The last IGC was held in 1984 in Moscow and previously in 1980 in Paris, the site of the first IGC in 1878. The July 9-14 meeting at the Washington Convention Center marks only the third time in its history that the United States will host the meeting. The last U.S. meeting of the IGC was in 1933.

The attendees will include earth scientists and researchers from the energy and minerals exploration industry, federal agencies, geological survey, and academic institutions. The scientific credentials of the Congress are underscored by more than 3000 oral presentations, over 100 pre- and post-Congress field trips to explore geology from Antarctica to Alaska, and more than 50 short courses and workshops.

Two major colloquia will highlight the 20th anniversary of the Apollo 11 lunar landing and provide an assessment of world natural resources. Other symposium sessions will include the latest research on the influence of extraterrestrial impact phenomena on the course of geologic history, including the death of the dinosaurs and other species; new tools and frontiers in the exploration for oil and gas; energy and mineral resources of the Circum-Pacific region; advances in earthquake prediction; hydrogeology; and rate and frequency of volcanic eruptions.

Hosts for the IGC, held in collaboration and under sponsorship of the International Union of Geological Sciences, are the U.S. Geological Survey and the U.S. National Academy of Sciences, working in cooperation with major U.S. earth science societies and industry organizations on behalf of the entire U.S. earth science community.

For further information contact:

Dr. Bruce Hanshaw  
Secretary General  
28th IGC  
P.O. Box 1001  
Herndon, VA 22070-1001  
703-648-6053

## Venus Geoscience Tutorials and Workshops

The NASA PGG Program and Magellan Project has encouraged the organization of several LPI-sponsored tutorials and/or workshops on Venus geoscience to take place between the spring of 1989 and the start of Venus mapping by Magellan, which is scheduled for July 1990. The major objectives of these tutorials and workshops will be to (1) summarize for the planetary geoscience community the rapidly evolving state of our knowledge of the surface and geology/geophysics of Venus, (2) prepare the community for the extremely large Venus geoscience "data dump" expected from Magellan, and (3) discuss mapping standards and provide early training in "radar geology" mapping in support of NASA's formal Venus Geologic Mapping Program, to begin after the Magellan mission in the early 1990s.

Joseph Boyce, NASA Program Scientist—Planetary Geosciences, has asked Gerald G. Schaber of the U.S. Geological Survey in Flagstaff to supervise the planning and organization of the first Venus Geoscience Tutorial (and associated Venus Geologic Mapping Workshop) to be held June 12-15, 1989 at the U.S.G.S. Field Center in Flagstaff, Arizona. A first announcement regarding the Venus tutorial and mapping-workshop has already been mailed. Anyone desiring a copy of this announcement or to be added to the mailing list should contact Pam Jones at the LPI (713-486-2450). For additional information, contact Pam Jones or Gerry Schaber (602-257-7485; FTS 765-7485).

## Change in Meeting Location

The conference on "The Sun in Time" is to be held in Tucson, Arizona, March 6-10, 1989, the week before the Lunar and Planetary Science Conference. Please note that this conference was originally scheduled to be held in Monterey, California, but due to administrative difficulties it was necessary to move it to Tucson. The new location of the conference is the Tucson Hilton East, 7600 E. Broadway. For further information, please contact Mildred S. Matthews, University of Arizona, at 602-621-2902.

## Publications

### Engineering, Construction and Operations in Space

Edited by Stewart W. Johnson and John P. Wetzel

A new book relating to space activities and lunar bases has been published by the American Society of Civil Engineers. This volume, the Proceedings of the Space 88 Conference held in Albuquerque, New Mexico, contains 125 papers providing in-depth discussions of space policy, extraterrestrial basing, space stations and orbiting structures, lunar surface construction and operations, lunar base design, martian basing, space environmental effects, role of space station technology, and other areas of special interest. To obtain a copy, write to

American Society of Civil Engineers  
345 East 47th Street  
New York, NY 10017  
212-705-7538

Library of Congress Catalog Card  
No. 88-21760  
ISBN 0-97262-671-7  
1988, 1349 pages, softcover, \$98 U.S.

### Science for Children: Resources for Teachers

This new publication is a guide designed to assist those who are working to improve elementary science education. The materials described here are recommended because they provide outstanding support for carrying out effective hands-on, inquiry-based programs. *Science for Children* has been prepared by the National Science Resources Center, a joint effort of the National Academy of Sciences and the Smithsonian Institution.

The guide is divided into three major sections: Curriculum Materials, Supplementary Resources, and Sources of Information and Assistance. A brief description of each item is included along with the address, phone contact, scope of the material, and price. It is divided by subject and contains several indexes to allow access to the information in a number of ways.

This guide should be available to every elementary teacher who is introducing science into the curriculum for the first time or to the experienced science teacher who is looking for new ideas and materials, as the guide can save a lot of time and effort in locating materials and evaluating them.

The 176-page guide is available from:

National Academy of Sciences Press  
2102 Constitution Avenue N.W.  
Washington DC 20007-5575

The price is \$7.95 for a single copy, \$6.50 for 2 to 9 copies, and \$4.95 for 10 or more copies; VISA/Mastercard/American Express is accepted.

## Publications

# National Space Society Launches New Publication

The National Space Society, a nonprofit organization that actively promotes space exploration, will publish a new monthly space magazine beginning in January 1989 entitled *Ad Astra*, which is Latin for "To The Stars." Editorial topics planned for *Ad Astra* during 1989 include articles on Space Station "Freedom," updates on shuttle missions, Mars exploration, the politics of space, superconductivity in space, commercial space, international programs, life sciences, remote sensing, space probes and satellites, spinoffs, missions of tomorrow, and interviews, plus all the latest activities of the National Space Society.

Subscriptions to *Ad Astra* are available for \$30 per year, and are a benefit of membership in the National Space Society.

Students and senior citizens receive a special subscription rate of \$18, and the rate for educators is \$20. Advertising will be accepted and media kits are available upon request.

The National Space Society, founded by a merger between the National Space Institute and the L5 Society, is one of the foremost civilian space advocacy groups in the world. Headquartered in Washington, D.C., the National Space Society has more than 20,000 members and 100 chapters worldwide. For more information, contact:

Kate McMains, Managing Editor  
National Space Society  
922 Pennsylvania Ave., S.E.  
Washington, DC 20003  
202-543-3991

## More Volumes Published in Isaac Asimov's Library of the Universe

When the first volume of Isaac Asimov's Library of the Universe series was reviewed in this Bulletin in February 1988, we were very pleased with the excellence of the book. Now that 16 volumes of the series have been published, it is obvious that the quality of the series will be maintained throughout the entire 32-volume sequence.

Publisher Gareth Stevens, Inc., working with Dr. Asimov, has selected a wide spectrum of astronomical time, events, and phenomena ranging from ancient astronomy to a book for the sun and each planet in our solar system, to quasars and black holes, space garbage, rockets and satellites, to UFOs, to future homes for human beings in space.

They have worked with various space organizations to acquire powerful, instructive and beautiful imagery to create clear, elucidative illustrations for each book in the series. Each volume contains Asimov's special contribution of "Amazing Facts" and "Unexplained Mysteries," which are both provocative and fun. A "Fact File" is included in the back matter of each book along with a glossary, guide for further reading, and, for children who wish to learn more, places to visit and write. An index appears in each book and Volume 33 will be a comprehensive index for the entire series.

The books are designated for Grades 3-4 but should be of interest to children whose ages range from 6-12. Asimov writes in a friendly and insightful way that presents the science facts and concepts in simple, thoughtful language.

The latest volumes in the set (volumes 11-16) include *Ancient Astronomy*, *How was the Universe Born?*, *Space Spotter's Guide*, *Earth: Our Home Base*, *Saturn: The Ringed Beauty*, and *Unidentified Flying Objects*. Each of the books is priced at \$9.95 and is library bound and cotton drill reinforced.

To order or request more information on this much needed series of books for the elementary science student, contact:

Gareth Stevens, Inc.  
7221 West Green Tree Road  
Milwaukee, WI 53223  
414-466-7550

Fran Waranius

## New Materials Available from A.S.P.

### Catalog of Education Materials

A new catalog from the nonprofit Astronomical Society of the Pacific features interesting materials about the exploration of the universe. It includes slide sets, a laser disk, and videotapes with the latest images from the world's largest telescopes and U.S. and Soviet space probes. Also featured are software packages for various home computers that can show the night sky in any orientation and simulate some of the techniques and principles of space flight. Posters, observing aids, audiotapes, and books to help youngsters learn about astronomy round out the 32-page catalog. To obtain a copy, please write to:

Catalog Requests  
A.S.P.  
390 Ashton Ave.  
San Francisco, CA 94112

The Society would be grateful if you can include two first class stamps to help with the mailing costs.

### Moon Kit

A new kit of slides and information about the Moon has been released by A.S.P. The 18 slides in the kit show many different aspects of the Moon, including close-ups of dramatic craters, lava tubes, and mountains, as well as a map of the far side of the Moon and photos from the Apollo 11 landing. The slides are accompanied by a 24-page book with detailed captions, background information, projects, activities, and an introductory reading list. Among the topics covered in the book are a guide to the phases of the Moon, explanations of the names of full moons (including "blue moon" and "harvest moon"), and a description of what it is like on the lunar surface. The booklet also has tables of the automated and manned lunar probes and a chart for telling time by the Moon.

The kit is ideal for teachers, students, and anyone interested in getting to know our planet's satellite more intimately. To order, send \$24.45 (which includes postage and handling) to:

A.S.P.  
Moon Kit Dept. NPK  
390 Ashton Ave.  
San Francisco, CA 94112

California residents should add sales tax. Orders from outside the U.S. should include \$3.00 for additional postage.

**ORDER FORM**  
**Lunar and Planetary Science**  
**ABSTRACTS of the Conference**

Prepayment (in \$US) required on all foreign orders.

To obtain abstracts enclose payment in U.S. dollars only (checks made out to LPI Order Dept.)

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## LPI Library Information Center (LIC) Computer Accounts

There are two LPI Library Information Center datasets available on-line. These are:

Username: PATRON

or

Username: SEARCH

Password (to either): LPI

**PATRON** contains the on-line card catalog, journals holdings, new arrivals, and a message facility for library users. **SEARCH** contains the Lunar and Planetary Bibliography, which has approximately 25,000 references to the lunar and planetary literature (only the Moon prior to 1978).

TO ACCESS:  
DIRECT DIAL: 713-486-9782 or 8214. This connection to the LPI VAX will give you the prompt *Username*. Enter **PATRON** or **SEARCH** as appropriate. Password on either account is **LPI**.

NASA/SPAN: SET HOST LPI::

Username prompts same as above.

OMNET (SEARCH SERVICE ONLY):

GOTO XDATA

One Moment please....Welcome to XDATA

Connect me to: **LPI.BSS**

AFTER CONNECTING TO SEARCH:

A message will appear identifying the search service, giving you the choice to select a number of news items and ask

DO YOU WISH TO CONTINUE (Y OR N)?

A "Y" response will begin the Search program sequence with a prompt for:

ACCOUNT NAME:

PASSWORD:

As a beginning user, you may use the general account NEWUSER, password SEARCH. This is NOT a VAX Username prompt.

REMEMBER: At any time you may type in the word HELP and you will receive on-line instructions.

Other important considerations—the Boolean operators are:

ampersand (&) to "and" terms together plus sign (+) to "or" terms.

At this point you may NOT combine "and" and "or" in the same search statement. A sample search statement would be entered thus:

PHOBOS&  
DEIMOS

This would result in a population in which both of these terms appear either in titles or in the keywords.

APOLLO 15+

APOLLO 16

Would result in a population in which either Apollo 15 or Apollo 16 appeared in the citation.

It is possible to refine your searches by using 99 in the date ranging statement. If 99 is typed for the year to begin and also for the year to end, then the next search statement will apply only to the search previously performed. For example:

After obtaining a file of the references with either Apollo 15 or Apollo 16, at the date-ranging feature type in 99 and 99 to both prompts, then structure another search statement, i.e.,

15014+

16240

This would result in a search of the Apollo 15/Apollo 16 file for references with either of these two sample numbers.

You can get an idea of the size of the file created if you will say "no" to the prompt "DO YOU WANT CITATIONS PRINTED ON YOUR SCREEN." The computer automatically puts the citations retrieved into a file for you to scan or print out later. By responding "no" you will get a year-by-year accounting of how many references were found as matches to your search statement, and a total number when it is finished. Then to see the references you may use the PRTOUT command and follow the instructions for previewing references on the screen or to your printer.

You may always get a list of the commands available by typing "HELP" or at the command level answer "PROMPTS".

Remember to "quit" when you are finished. For additional help or information call Stephen Tellier at 713-486-2191 or on NASA/SPAN LPI::STEPHEN.

AFTER CONNECTING TO PATRON:

Menus and prompts will direct you to the individual databases in this account. The same Boolean operators are available in Catalog as in SEARCH. At present searching the card catalog is sometimes a lengthy process. There are plans to upgrade soon.

## SPAN Holds Last Meeting

The Data Systems Users Working Group (DSUWG) was formed in 1980 to provide guidance to NASA in the management of the Span Physics Analysis Network (SPAN). The most recent meeting of the DSUWG was held in Anaheim, California on October 24-26, 1988. It was attended by approximately 75 scientists and network managers. Ron Zwickl of the NOAA Environmental Research Laboratories chaired the meeting in Chairman Daniel Baker's absence.

SPAN administration from the U.S. and Europe gave presentation on SPAN operations. There were presentations on uses of SPAN, including the transfer of NOAA images, access to SIMBAD, use by ocean scientists, access to the National Oceanographic Data Center (NODC), and access to the San Diego Supercomputer Center (SDSC).

One of the major issues addressed at this meeting was the merger of NASA's DECnet (SPAN) and TCP/IP (NSN) network user groups. Several presentations were given by the NSIPO (NASA Science Internet Project Office), and SPAN management to better inform the DSUWG on what the merger involved. Presentations included the future of science networking for NASA as seen by NASA Headquarters Code E and a report of the results of dual protocol testing. A presentation by the NSIPO on its future plans helped the DSUWG attendees to better understand the relationship between SPAN, NSI, and NSN. The DSUWG's final decision was that the two users groups should merge within the next year. The details for the implementation of the merger will be worked out by representatives from each group and a new name will be decided upon. The next meeting of this group will be the first joint users group meeting.

Security was another major topic discussed at the DSUWG meeting. Pat Sisson, the SPAN Security Manager, gave a security overview, discussed the procedures for reporting security incidents, mentioned the techniques used to protect the NSSDC computers, and indicated that the NSSDC will develop a security "tool box" that will be useful to other SPAN system managers to protect their systems. She also discussed a new computer security law that affects all government and government-funded computer systems containing sensitive data. The new law requires the managers of the systems to protect their data.

The SPAN management team now includes an Internetworking Manager, who is working on issues such as dual protocol testing, coordination with other wide-area networks, and the migration of SPAN to OSI (the International Standards Organization's Open System Interconnect). He is also working with others from HEPNET and Digital Equipment Company to develop a coordinated plan for the migration of SPAN and HEPNET to DECnet PHASE V/OSI.

## LPI Computer Access from Omnet

Whether you're in Valparaiso, Indiana or Valparaiso, Chile, you can access the LPI's computers. International access is available on SCIENCEnet, an electronic mail network from Omnet, Inc.

LPI databases currently available are the Geophysical Data Facility, the Lunar and Planetary Science Conference Program (option LPI) and the Bibliographic Search Service (option LPI.BSS). Others will be added soon.

To access the LPI from a SCIENCEnet mailbox, just type:

**Command? Goto XDATA  
Connect me to: LPI (or LPI.BSS)**

LPI is just one of the databases available. There's also Plnet (from the American Institute of Physics); ASTIS (from the Space Telescope Science Institute); ADC (the Astronomical Data Center of the National Space Science Data Center); and SIMBAD (Set of Identifications, Measurements, and Bibliography for Astronomical Data of the Strasbourg Astronomical Data Centre; you must have an ID assigned by the Smithsonian Astrophysical Observatory to access SIMBAD). Many other databases—oceanographic, climatic, polar—are also available on SCIENCEnet.

SCIENCEnet offers researchers access from most places in the world. Scientists in two experiment groups currently log on from three continents. Electronic mailing lists and many general and specific bulletin boards facilitate communication.

From a SCIENCEnet mailbox you can send messages to NASAmail, Plmail, Bitnet, Internet, SPAN, Dialcom, Easylink, and many other systems. You can also send telex and fax messages.

For more information about SCIENCEnet, write:

Omnnet, Inc.  
137 Tonawanda St.  
Boston, MA 02124  
617-265-9230

## OSSA-Sponsored

# NASA Science Internet Project

The NASA Science Internet (NSI) project is sponsored by NASA's Office of Space Science and Applications (OSSA) and is responsible for providing networking services to OSSA-funded researchers worldwide. The NSI network infrastructure includes both SPAN (a DECnet-based net) and NSN (TCP/IP based). In addition, the NSI formally cooperates with non-NASA networks (i.e., NSFnet or HEPnet) to provide additional connectivity. Plans for FY89 include the following:

- Meet all OSSA science communications requirements using SPAN, NSN, and other cooperating networks.
- Consolidate diverse networking activities into optimum design to improve both connectivity and interoperability and to reduce costs.
- Encourage international regional infrastructure (Pacific Basin, Europe, South America) and make connections as appropriate.
- Build effective operations environment including trouble reporting/resolution and act as a clearing house for network information.
- Improve customer support by defining and initiating development of user, security, and network tools.

- Further the interoperability of SPAN with NSN (DECnet with TCP/IP).
- Demonstrate use of new technology, methodologies, and service offerings.
- Improve understanding of security issues and implement preventive security measures.
- Promote resource sharing with other providers, e.g., NSF or DOE.
- Participate in NASA user information forums, e.g., Lunar and Planetary Science Conference and Data Systems Users Working Group (DSUWG).
- Participate in Joint NASA Code E (OSSA)/Code T (Office of Space Operations) study on interagency internetworking.
- Participate in Strategic Planning with Code EC (Communications Division of OSSA).

Representatives of NSI will be attending the 20th Lunar and Planetary Science Conference in Houston this spring. They will take this opportunity to meet with the science community in attendance, and they hope that individual concerns or issues regarding networking will surface as a result. The NSI Project Office encourages your comments or queries and can be reached directly by telephone (415-694-5859, FTS 464-5859) from 7:30 a.m. 5:00 p.m. Pacific time.

## LPI Telecommunications Numbers

This list of LPI telecommunications numbers is provided for your convenience:

**LPI Telex Number: 2400832  
Answerback: LPI-LC**

**LPI FAX Number:  
713-486-2162**

**Direct dial access to LPI VAX:  
713-486-8214 or  
713-486-9782**

**LPI SPAN Node Name: LPI  
Guest Account Username: LPI  
No Password Needed**

**Bibliography Username: SEARCH  
Password: LPI**

**NASAmail Account: LPI**

# Education News

## International Space University

The International Space University (ISU), headquartered in the United States, is a nonprofit international graduate education program for space development and research. The first educational institution of its kind in the world, ISU was founded in 1987 to provide graduate-level students who demonstrate academic excellence and leadership qualities with an annual Summer Session embracing eight concentrations of study in a multidisciplinary approach to space science and policy. The Summer Session offers projects of importance for the advancement of space research and development. The intensive summer course, consisting of over 240 hours of lectures and 280 hours of design project work, compresses a full year of study into two months.

At ISU's 1988 Summer Session, held at the Massachusetts Institute of Technology, 104 students from leading educational institutions in 21 nations spent two months covering Space Life Sciences, Resources and Manufacturing, Satellite Applications, Space Sciences, Business and Management, Space Architecture, Space Policy and Law, and Space Engineering. A joint class project was the development of a model international lunar base. Future Summer Sessions will be held in Europe and other regions.

The ISU Board of Directors and Board of Advisors is comprised of distinguished business and government leaders, scientists, space experts, and academicians from many countries. In addition, there are 10 ISU liaisons throughout the world. They are located in Canada, India, Japan, People's Republic of China, Sri Lanka, Switzerland, United Kingdom, United States, USSR, and the European Space Agency. ISU is supported by over 70 corporate and governmental sponsors.

An agreement formalizing cooperation between the Moscow Aviation Institute (MAI) and ISU was signed in Moscow on December 16 designating MAI as the Soviet Union's official National Liaison to ISU.

The agreement followed a week of negotiations held at MAI, the leading academic institution for aeronautics and aeronautics in the USSR. The cooperation agreement was initiated following the Soviet Union's successful participation in the inaugural ISU'88 Summer Session program held at the Massachusetts Institute of Technology. Four of twelve Soviet students who participated in ISU'88 came from MAI as the result of a U.S. \$100,000 grant scholarship underwritten by the USSR State Committee on Public Education.

Included in the ISU/MAI agreement is the possibility that MAI may host a future ISU Summer Session following the 1989 program, which will be held at the Université Louis Pasteur in Strasbourg, France, June 30 through August 31.

The agreement between Moscow Aviation Institute and the International Space University is subject to approval by the ISU Board of Directors.

## Astronomy Day: Taking Astronomy to the People

1989 marks the 16th year that amateur and professional astronomers have banded together to host special events worldwide promoting astronomy to the general public. This year's Astronomy Day has been set for May 13, 1989. Now is the time for astronomy clubs, science museums, astronomy departments, planetariums, etc., to start planning events for the spring. To aid these institutions, the Astronomical League has published a 120-page handbook listing ideas, suggestions, and resources. This booklet was produced under the V. M. Slipher grant of the National Academy of Sciences and is free (while supplies last), except for a minimal \$2.00 charge for postage and handling. Requests from outside the U.S. should include \$3.00 in U.S. currency.

The first annual "Sky and Telescope Astronomy Day Award" is being offered in 1989 to the organization that best exemplifies the concept of Astronomy Day. First prize is a \$100 gift certificate from Sky Publishing. For a set of rules and entry forms (without ordering the handbook), send a self-addressed, stamped legal size envelope to:

Gary E. Tomlinson  
Astronomy Day Coordinator  
Astronomical League  
c/o Chaffee Planetarium  
54 Jefferson Avenue S.E.  
Grand Rapids, MI 49503  
616-456-3985

Astronomy Day is sponsored by 13 astronomy and astronomy education organizations representing a combined membership of over 130,000 people. Individuals wanting more information about local events should contact their local astronomy institution.

## Earlier Launch Date Set for NASA Hubble Space Telescope

NASA has rescheduled the launch of the Hubble Space Telescope from February 1990 to December 1989. The earlier date was made possible following reassessment of a variety of factors including payload requirements and Space Shuttle orbiter assignments during the period.

The telescope, which fills the orbiter cargo bay, will be deployed by the Shuttle crew with the aid of the orbiter remote manipulator system.

The Hubble telescope is the first spacecraft designed for routine on-orbit servicing by the Space Shuttle crew. In the mid-1990s, a Shuttle crew is expected to revisit the telescope to replace onboard scientific instruments with new instruments incorporating advanced technology now under development.

The Astrophysics Division of the Office of Space Science and Applications, NASA Headquarters, and the project management center, Marshall Space Flight Center, will establish a new shipping schedule for the Hubble spacecraft, which is presently located at the Lockheed Missiles and Space Co. facility in Sunnyvale, California. The schedule for a final ground systems test involving the Hubble spacecraft also may be affected.

NASA Press Release 88-143

## Results of PCWG Image Display Questionnaire

At last year's LPSC, a questionnaire was distributed to ask the planetary community about the level of interest in digital image processing and display. Although the response was somewhat disappointing there does appear to be a good core of interest. A list of the names will be kept for future distribution of information about CDROMs. The production of Voyager CDs is nearly complete, and the Planetary Data System (PDS) and Washington University are beginning to put Viking images on CD. A large image database of Mars that was created for Mars Observer will also be put on CD. The Magellan Project is producing a Venus CD with Pioneer Venus and Earth-based radar data.

Thanks to those who responded; any others who have an interest in working with CDs can contact me at 818-354-3372 and your name will be added to the list.

Stephen Saunders  
Jet Propulsion Laboratory

# Calendar

## March

5-10

**Symposium on Space Commercialization: Roles of Developing Countries**, Nashville, Tennessee. Prof. F. Shahrokyi, University of Tennessee Space Institute, Tullahoma, TN 37388. Phone: 615-455-0631.

6-10

**The Sun in Time**, Tucson, Arizona. M. S. Mathews, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721. Phone: 602-621-2902

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.

20-23

**European Union of Geosciences V**, Strasbourg, France. Organizing Committee EUG V, Geological Survey of Norway, Box 3006 Lade, N-7002 Trondheim, Norway.

20-22

**Brown University—Vernadsky Institute Microsymposium 9**, Providence, Rhode Island. Angel Hilliard, Department of Geological Sciences, Box 1846, Brown University, Providence, RI 02912. Phone: 401-863-2436 or 2526.

## April

6-9

**National Science Teachers' Association National Convention**, Seattle, Washington. Bill Schmitt, Pacific Science Center, 200 Second Ave., N., Seattle, WA 98109. Phone: 206-443-2904.

28-30

**MFVTW Workshop on Tectonic Features on Mars**, Richland, Washington. Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.

24-28

**Comets in the Post-Halley Era**, Bamberg, Federal Republic of Germany. R. Newburn and J. Rahe, Jet Propulsion Laboratory, 264-664, 4800 Oak Grove Drive, Pasadena, CA 91109.

24-28

**IAU Colloquium No. 116: "Comets in the Post-Halley Era,"** Bamberg, F. R. Germany. J. Rahe, Code EL, NASA Headquarters, Washington, DC 20546. Phone: 202-453-1597.

## May

(date to be announced)

**Planetary Detection Workshop**, Houston, Texas. Ken Nishioka, Mail Stop 244-14, NASA Ames Research Center, Moffett Field, CA 94035. Phone: 415-694-6540.

10-14

**Ninth SSI/Princeton Conference on Space Manufacturing**, Princeton, New Jersey. Mary Ann Grams, Space Studies Institute, P.O. Box 82, Princeton, NJ 08542. Phone: 609-921-0377.

14-17

**Joint Annual Meeting, Geological Association of Canada and the Mineralogical Association of Canada**, with the participation of the Canadian Geophysical Union. Dr. Colin Stearn, Chairman, Local Organizing Committee for Montreal '89, Rm. 238, 3450 University St., Montreal, Quebec, H3A 2A7. Phone: 514-398-4082.

26-29

**Eighth Annual International Space Development Conference**, Chicago, Illinois. SDC Ltd., P.O. Box 64397, Chicago, IL 60664-0397.

## June

6-8

**Fourteenth Symposium on Antarctic Meteorites**, Tokyo, Japan. Takao Hoshiai, Director-General, National Institute of Polar Research, 9-10 Kaga 1-Chome, Itabashi-ku, Tokyo 173, Japan.

11-15

**174th Meeting of the American Astronomical Society**, Ann Arbor, Michigan. Richard Teske, Astronomy Department, David M. Denison Bldg., University of Michigan, Ann Arbor, MI 48109. Phone: 313-764-3398.

12-15

**Venus Geoscience Tutorial and Venus Geologic Mapping Workshop**, Flagstaff, Arizona. Pam Jones, Lunar and Planetary Institute, 3303 NASA Road One, Houston, TX 77058-4399. Phone: 713-486-2150.

19-23

**IAU Colloquium No. 119: "Comparative Planetology and the Origin of the Solar System,"** Nanjing, China. H. J. Smith, Astronomy Department, R. L. Moore Hall, 15-206, University of Texas, Austin, TX 78712. Phone: 512-471-3300.

21-23

**Centennial Scientific Meeting of the Astronomical Society of the Pacific**, Berkeley, California. Berkeley Meeting Information, A.S.P., 390 Ashton Ave., San Francisco, CA 94112. Phone: 415-337-1100.

26-July 1

**IAU Colloquium No. 118: "Dynamics of Small Bodies in the Solar System,"** Nanjing, China. J. Henrard, Facultés Universitaires de Namur, Rempart de la Vierges 8, 5000 Namur, Belgium.

27-30

**Twenty-eighth Liège International Astrophysical Colloquium**, Liège, Belgium. J. C. Gerard, Institute of Astrophysics, 5, Avenue de Cointe, B-4200 LIEGE-OUGREE, Belgium.

# Calendar

## July

9-19

**28th International Geological Congress,** Washington, D.C. Dr. Bruce Hanshaw, Secretary General, 28th IGC, P.O. Box 1001, Herndon, VA 22070-1001. Phone: 703-648-6053.

24-Aug. 4

**International Association of Geomagnetism and Aeronomy, 6th Scientific Assembly,** Exeter University, United Kingdom. Dr. Roy Jady, IAGA 1989 Organizing Secretary, Department of Mathematics, University of Exeter, Exeter ED4 4QE, United Kingdom.

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-Aug. 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.

## September

24-29

**Seventh International Conference on Geochronology, Cosmochronology and Isotope Geology,** Canberra, Australia. Organizing Committee, ICOG 7, Research School of Earth Sciences, Australian National University, G.P.O. Box 4, Canberra, A.C.T. 2601, Australia.

## October

2-6

**Seventh Thematic Conference on Remote Sensing for Exploratory Geology,** Calgary, Alberta, Canada. Robert H. Rogers, Chairman, Program Committee, ERIM, P.O. Box 8618, Ann Arbor, MI 48107-8618. Phone: 313-994-1200, ext. 3382.

23-27

**International Symposium on First Results of the Phobos Mission and Future Space Exploration of Mars,** Paris, France. C. de Bergh, Observatoire de Paris, 92195 MEUDON Cedex, France.

30-Nov. 3

**Annual Meeting of the Division for Planetary Science of the American Astronomical Society,** Providence, Rhode Island. Carle Pieters, Department of Geological Sciences, Brown University, Providence, RI 02912. Phone: 401-863-2417.

## November

6-9

**Geological Society of America Annual Meeting,** St. Louis, Missouri. Edna Collis, G.S.A., 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301. Phone: 303-447-2020 or 1-800-GSA-1988.

## LPI Announces Summer Research Opportunity

The Lunar and Planetary Institute is once again offering selected undergraduates an opportunity to participate actively in lunar and planetary research with scientists at the Institute and at the NASA Johnson Space Center. The purpose of this program is to expose undergraduate students in planetary and terrestrial studies to an actual research environment in order to help them examine and focus on their goals. Typical projects in past years have included studies in cosmic dust and lunar sample characterization, meteorites and their origins, properties of planetary regoliths and atmospheres, planetary volcanism, geochemistry, and spectroscopic observations of planetary surfaces. Each project is directed by an LPI or JSC scientist.

College undergraduates with at least 50 semester hours credit who are interested in pursuing a career in the physical sciences are eligible. Selection is based upon the following

criteria: (1) scholarship, curriculum, and experience, (2) career objectives and scientific interest, and (3) match of interest of applicant with available research projects.

The application deadline for this year's Summer Intern Program is March 13, 1989. For questions concerning the application information or the Summer Intern Program in general, please contact:

LPI Projects Office  
3303 NASA Road One  
Houston, TX 77058-4399  
713-486-2150 or 2158

This program is supported by the LPI through funding from NASA Headquarters through the Universities Space Research Association.

**PRELIMINARY CONFERENCE PROGRAM**  
**20th Lunar and Planetary Science Conference**  
**March 13-17, 1989**

Monday, March 13, 1989  
**MARS REMOTE SENSING**  
8:30 a.m. Gilruth 104

- Lee S. W.\* Clancy R. T.  
*Viking IRTM Observations: Regional Albedo and Photometric Studies of Mars*
- Dollfus A.\* Deschamps M. Zimbelman J.  
*Gradiometry of the Martian Surface by Photopolarimetry*
- Guinness E. A.\* Arvidson R. E.  
*Viking Optical and Thermal Evidence for Widespread Duricrust Substrate on Mars*
- Strickland E. L. III\*  
*Physical Interpretation of Thermal and Reflected Data on Martian Surface Units*
- Pinet P.\* Chevrel S.  
*Earthbased Telescopic Near-infrared Probing of Mars by CCD-imaging*
- Bell J. F. III\* McCord T. B. Lucey P. G.  
*Iron Oxide Mineralogy on Mars: New Results Based on High Resolution Imaging Spectroscopy During 1988*
- Morris R. V.\* Lauer H. V.  
*Effect of Matrix Properties on the Reflectivity of Dispersed Microcrystalline Hematite: Implications for Martian Spectral Data*
- Bibring J.-P.\* Combes M. Encranaux T. Erard S. Forni O. Gondet B. Head J. Ksanfomali L. Langevin Y.  
Masson P. Moroz V. Peters C. Roccard F. Sotin C. Soufflot A.  
*ISM Observations of Mars: Very First Results*
- Metzger A. E.\* Haines E. L.  
*Gamma-ray Methods for the Measurement of Atmospheric Thickness and Surface Pressure at Mars*
- Feldman W. C.\*  
*Neutron Signature of Carbon Dioxide and Water Ice at the Martian South Pole*
- Gaffey S. J.\*  
*Carbonates on Mars: A Sedimentological Perspective*
- Chyba C. F.\* Squyres S. W. Sagan C.  
*Depth to Unoxidized Material in the Martian Regolith*
- Traub S. G.\* Cassidy W. A.  
*Alteration of Campo Del Cielo Soil by Meteorite Impact: Implications for the Surface of Mars*

**POSTER PRESENTATIONS**

- Bartels K. S. Burns R. G.  
*Oxidized Olivines on Mars: Spectroscopic Investigations of Heat-Induced Aerial Oxidation Products*
- Crisp J. Bartholomew M. J.  
*Mid-infrared Spectroscopy of Palagonite*
- Edgett K. S. Christensen P. R.  
*The Physical Properties of Dark Intracrater Materials on Mars: Examination of Photographic and Thermal Infrared Data*
- McEwen A. S. Soderblom L. A. Swann J. D. Becker T. L.  
*Mars' Global Color and Albedo*
- Neukum G. Drescher A. Enderlein G. Gonano M. Hiller K. Hoffmann H. Jaumann R. Lehner M. Regner P.  
Ress E. Richter R. Schmidt K. Schwarz G. Albertz J. Ebinger H.  
*High Resolution Stereo Camera (HRSC) Experiment Proposal for the Soviet Mars 94 Mission*
- Stoker C. R. Mancinelli R. Tsay F. Kim S. White L. Sculley J.  
*Degradation of Organic Compounds under Simulated Martian Conditions Strickland E. L. III Surface Photometric Properties and Albedo Changes in the Central Equatorial Region of Mars*
- Thompson T. W.  
*Goldstone Radar Observations of Mars: The 1986 Opposition*

PRESENTED BY TITLE ONLY

Gaffey S. J.

*Carbonates on Mars?: Requirements for Detection and Characterization Using Reflectance Spectroscopy*

Morris R. V.

*Reflectivity Spectra (350-2200 nm) of SNC Meteorites*

Mustard J. F. Pieters C. M. Pratt S. E.

*Systematics of the 1.0  $\mu\text{m}$  Absorption Band in Reflectance Spectra of Actinolite*

Pieters C. M.

*Seeing Through the Dust and Alteration Products of Mars*

Presley M. A. Christensen P. R.

*The Distribution and Origin of Duricrust on Mars*

Smith M. Q. Adams J. B.

*Isolation of Compositional Variance from Viking Lander Multispectral Images*

Strickland E. L. III

*Physical Properties of Oxio/Lunae Planum and Arabia-Type Units in the Central Equatorial Region of Mars*

Strickland E. L. III

*Physical Properties of Meridiani Sinus-Type Units in the Central Equatorial Region of Mars*

Zolotov M. Yu.

*Water-bearing Minerals in the Martian Soil (Thermodynamic Prediction of Stability)*

Monday, March 13, 1989

CHONDRULES AND ORDINARY CHONDRITES

8:30 a.m. Gilruth Gym

Kurat G.\* Palme H.

*Origin of Chondrules*

Wood J. A.\* Hashimoto A. Holmberg B. B.

*Chondrules as Near-Equilibrium Assemblages that Formed in Fractionated Systems*

Hewins R. H. Kozul J. M.\* Ulmer G. C.

*Allende Olivine Chondrules, Ferroan Olivine and Oxidation*

DeHart J. M.\* Lofgren G. E. Sears D. W. G.

*The Composition and Luminescence Properties of Chondrule Olivines and Pyroxenes in the Type 3 Ordinary Chondrites*

Jones R. H.\*

*Petrology and Conditions of Crystallization of Type II FeO-rich Chondrules in Semarkona (LL3.0)*

McCoy T. J.\* Scott E. R. D. Jones R. H. Keil K.

*Homogenization of Chondrule Silicates in Ordinary Chondrites: Constraints on Asteroidal Metamorphism*

Hewins R. H.\* Radomsky P. M. Connolly H. C. Jr.

*Influence of Melting Kinetics on the Formation of Barred Olivine Chondrules*

Lofgren G.\*

*Dynamic Crystallization Experiments on Pyroxene-rich Chondrule Melts: Comparison of Experimentally Produced and Natural Textures and Mineral Compositions*

Graf T.\* Marti K.

*Exposure Ages of H-Chondrites and Parent Body Structure*

Skinner W. R.\*

*Compaction and Lithification of Chondrites*

Alexander C. M. O'D.\* Arden J. W. Pillinger C. T.

*Carbonaceous Components in Ordinary Chondrites: Implications for Metamorphism Vs. Heterogeneous Accretion*

Hasan F. Score R. A. Sears D. W. G.\*

*The Natural Thermoluminescence Survey of Antarctic Meteorites—A Discussion of Methods for Reporting Natural TL Data*

Hutcheon I. D.\* Hutchison R. Kennedy A.

*Mg Isotopes and Rare Earth Abundance in Plagioclase from Ordinary Chondrites: A Search for  $^{26}\text{Al}$*

## POSTER PRESENTATIONS

Batchelor J. D. Sears D. W. G.

*Thermoluminescence of Plagioclase Feldspars and Implications for Meteorite Studies*

Fanale F. Clark B.

*Regolith Processes as Possible Reflectance Spectra Controls*

Hudson M.

*Shock Effects in II Group Chondrites*

Smith M. R. Koppenaal D. W. Gosselin D. C. Laul I. C.

*Direct Analysis of Terrestrial and Meteorite Samples Using Laser Ablation Inductively Coupled/Mass Spectrometry*

## PRESENTED BY TITLE ONLY

DeHart J. M. Lofgren G. E. Sears D. W. G.

*Cathodoluminescent Phosphors in the Matrices of Type 3 Ordinary Chondrites*

Marakushev A. A. Granovsky L. B. Zinov'yeva N. G. Mitreikina O. B.

*Microprobe Analysis of chondrite Yefremovka (C3): New Data and Their Genetic Interpretation*

Kashkarov L. L. Korotkova S. N. Kashkarova V. G. Skripnik A. Ya.

*Investigation of Nikol' Skoe 14-5 Chondrule Olivines by Thermoluminescence Method*

Kashkarov L. L. Kalinina G. V.

*Track Studies in Olivines from Chondrules and Matrix for the Ordinary Chondrites Tieschitz 13, Saratov 14, and Elenovka 15*

Koeberl C. Horsch H. E. Merkle R. K. W. Reitnold W. U.

*New Mineralogical and Chemical Data on the Machinga (16) Chondrite, Malawi*

Matsuda H. Nakamura N. Noda S.

*Allende Chondrules: Further Demonstration of Fractionated and Unfractionated REE and Alkali Metals*

Metzler K. Bischoff A.

*Accretionary Dust Mantles in CM Chondrites as Indicators for Processes Prior to Parent Body Formation*

Miyamoto M.

*Carbonates in Some Meteorites: Information from Absorption Ba Bands Near 7 μ*

Nagahara H.

*Formation of Chondrules and Matrix Materials in the Heterogeneous Solar Nebula*

Nakamura N. Shimaoka T.

*Experimental Investigation of Vaporization and Fractionation of Alkali Metals During Melting of a Chondritic Material and Their Bearing on Chondrule Formation*

Noda S. Nakamura N.

*REE, Sr, Ba and Alkali Metal Characteristics of Fine-Grained Rims from Allende Chondrules*

Skinner W. R.

*Cold Vs Hot Accretion of Tieschitz and Other Chondrites*

Monday, March 13, 1989

COSMIC DUST I

8:30 a.m. Gilruth 206

Jackson A. A.\* Zook H. A.

*Resonance Trapping of Comet and Asteroid Dust Particles by the Earth and Mars*

Tsou P.\* Aubert J. Brownlee D. Hrubesh L. Williams J. Albee A.

*Effectiveness of Inert Capture Media*

Lindstrom D. J.\* Zolensky M. E. Lindstrom M. M.

*Procedures for Instrumental Neutron Activation Analysis of Individual Cosmic Dust Particles*

Gibson E. K., Jr.\* Hartmetz C. P. Blanford G. E.

*Analysis of Interplanetary Dust Particles for Volatiles and Simple Molecules*

Rietmeijer F. J. M.\* Mukhin I. M. Ponorenko M. N. Evlyakov E. N.

*Layer Silicate Chemistry in P/Comet Halley from Puma-2 Data*

McDonnell J. A. M.\* Pankiewicz G. S. A. Green S. E. Perry C. H.

*The Comet Nucleus: Ice and Dust Morphological Balances in a Production Surface of Comet P/Halley*

Mukhin L. M.\* Dikov Yu. P. Evlanov E. N. Fomenkova M. N. Nazarov M. A. Prilutsky O. F. Sagdeev R. Z.  
Zubkov B. V.

*Possible Composition of Halley Comet Dust (Si-rich Particles) According to the Data Obtained by Mass-Spectrometer Puma-2*

Klöck W.\* Thomas K. L. McKay D. S.

*Identification of Solar Nebula Condensates in Interplanetary Dust Particles, Unequilibrated Ordinary Chondrites and Carbonaceous Chondrites*

Roessler K.\* Hsiung P. Kochan H. Hellmann H. Düren H. Thiel K. Kölzer G.  
*A Model Comet Made from Mineral Dust and H<sub>2</sub>O-CO<sub>2</sub> Ice: Sample Preparation Development*

Alexander W. M.\* Hyde T. W.

*Micron and Submicron Particle Flux Enhancement Within the Earth's Magnetosphere I: In-Situ and Laboratory Source Data*

Hyde T. W.\* Alexander W. M.

*Micron and Submicron Particle Flux Enhancement Within the Earth's Magnetosphere II: Transport Mechanisms and Particle Dynamics in Cislunar Space*

Gaffney E. S.\* Hyndman D. A.

*Micrometeorite Impact on Thin Films: Numerical Simulation*

Lifshman K.\*

*Computer Simulation of Dust Grain Evolution*

#### POSTER PRESENTATIONS

Brownlee D. E. Schramm L. S. Wheelock M. M. Maurette M.  
*Large Mineral Grains in Interplanetary Dust*

Hyde T. W. Alexander W. M.

*Micron and Submicron Particle Flux Enhancement Within the Earth's Magnetosphere III: Charged Particle Trapping and Enhanced Lifetime Criteria Between L Values 1.7 and 3.0*

Kochan H. Ratke L. Hellmann H. Thiel K. Grün E.

*Particle Emission from Artificial Cometary Surfaces: Material Science Aspects*

Rietmeijer F. J. M. Mackinnon I. D. R.

*Grain Size Distributions of Magneli Phases and Metallic Titanium in Chondritic Porous Interplanetary Dust Particles*

Thiel K. Kölzer G. Kochan H. Grün E. Kohl H.

*Crustal Evolution and Dust Emission of Artificial Cometary Nuclei*

Tsou P. Bradley J. G. Brownlee D. E. Albee A. L.  
*Nondestructive Cosmic Dust Positioning and Velocity Sensor*

Wassenberg R. Antz C. Baudron M. Büttkewitz A. Jessberger E. K. Knochel A. Traxel K.  
*Multielement Analyses of Interplanetary Dust Particles with PIXE and SYRFA*

Yates P. D. Wright I. P. Pillinger C. T. Hutchison R.  
*Carbon Isotopic Measurements of Deep Sea Spherules*

Zook H. A. Cour-Palais B. G. Allton J. H.  
*On the Meteoroid Flux Striking the Solar Max Satellite*

Monday, March 13, 1989  
**MARS: REMOTE SENSING/VOLCANISM**  
1:30 p.m. Giltroph 104

Harmon J. K.\*

*Comparison of Mars Radar Scattering Measurements at Widely Separated Subradar Latitudes*

Moore H. J.\* Thompson T. W.

*Martian Quasi-Specular Echoes: Preliminary 1986 Results*

Blaney D. L.\* McCord T. B.

*Telescopic Detection of Sulfur Compounds on Mars*

Roush T.\* Pollack J. Stoker C. Witteborn F. Bregman J. Wooden D. Rank D.  
*CO<sub>2</sub> and SO<sub>2</sub>-Bearing Anionic Complexes Detected in Martian Atmospheric Dust*

Fisher D. S. Burns R. G.\*

*Acid Weathering on Mars: Spectroscopic Investigations of Sulfuric Acid — Degraded Olivines and Sulfides*

Crisp J.\* Baloga S.

*Estimating Eruption Rates of Planetary Lava Flows*

Balog S.\* Crisp J.  
*Gravitational Scaling of Kilauea Eruptions*

Francis P. W.\* de Silva S. L. Mouginis-Mark P. J. Self S.  
*Large Diameter Volcanic Spatter Rings: Mechanisms of Origin and Significance for Planetary Studies*

Fink J.\* Griffiths R.  
*Laboratory Simulations of Lava Flows with Solid Crusts*

Condit C. D.  
*Volcanotectonic Patterns on the Southeast Flank of Alba Patera*

Fogel R. B.\* Rutherford M. J.  
*Volcanism on Mars: Experiments on CO<sub>2</sub> Solubility in Silicic Magmas*

McBride K.\* Zimbelman J. R.  
*Evidence of Pyroclastic Activity near Elysium Mons, Mars*

#### POSTER PRESENTATIONS

Christensen P. R. Thliveris S. L.  
*Thermal Infrared Spectral Observations of Coated Surfaces*

Greeley R. Crown D. A.  
*Volcanic Geology of Tyrrhena Patera: Morphologic Similarities to Terrestrial Ash Shields*

McBride K.  
*Geologic and Structural Features of the Elysium Mons Caldera*

Mura Y. Sasaki S. Kawashima N. Yamori A.  
*Identification of Planetary Surfaces by Remote Secondary-Ion Method*

Moore H. J. Ackerman J. A.  
*Martian and Terrestrial Lava Flows*

Posin S. B. Greeley R.  
*Effect of Eruptive Conditions on Volcano Morphology*

Salisbury J. W. D'Aria D.  
*Measurement of Christiansen Frequencies in Spectra of Particulate Samples for Determination of Rock Composition*

Sunshine J. M. Pieters C. M. Pratt S. F.  
*Mathematical Deconvolution of Mineral Absorption Bands*

Whitford-Stark J. L.  
*Application of Remote Sensing Techniques to Alkaline Volcanic Rocks: Trans-Pecos, Texas*

Zimbelman J. R. McBride K. M.  
*A Possible Pyroclastic Deposit Near Elysium Mons, Mars.*

#### PRESENTED BY TITLE ONLY

Anderson D. Mann M.  
*VICAR Image Processing Using Unix, X Windows, and CDROMs*

Azuma H. Fujii N.  
*Grain Size Effects on Spectral Reflectance of Ol, Opx and Cpx Minerals - Applied to the Hull Quotient Method*

Benes K.  
*The Role of Analogy and Exclusiveness in Planetary Geology*

Crown D. A. Greeley R. Sheridan M. F. Carrasco R.  
*Analysis of an Ignimbrite Plateau in the Central Andes Using Landsat Thematic Mapper Data: Implications for the Identification of Ash Deposits on Mars*

Edgett K. S.  
*The Lobate Features West of Each of the Tharsis Montes Mars: A Re-evaluation of Their Origins*

Fisenko A. V. Kasanova N. N. Semjonova L. F. Chumak E. I. Surkov Yu. A. Lavrukhina A. K.  
*Alteration of Reflectance Spectra for Quartz Processed by Laser Radiation*

Morris R. V. Agresti D. G. Shesler T. D. Wdowiak T. J.  
*Mossbauer Backscatter Spectrometer: A New Approach for Mineralogical Analysis on Planetary Surfaces*

Parfitt E. A.  
*Theoretical Constraints on the Location of Eruptions and Intrusions of Planetary Volcanoes: Data from Kilauea Volcano, Hawaii*

Raitala J. Kauhanen K.

*Lavas, Calderas and Magma Chambers of Alba Patera on Mars*

Wilson L. Parfitt E. A.

*The Influence of Gravity on Planetary Volcanic Eruption Rates: A Reappraisal*

Zimbelman J. R. Fink J. H.

*Estimates of Rheologic Properties for Flows on the Martian Volcano Olympus Mons*

**Monday, March 13, 1989**  
**CARBONACEOUS CHONDRITES**  
1:30 p.m. Gilruth Gym

Arden J. W. Ash R. D.\* Grady M. M. Wright I. P. Pillinger C. T.

*Further Studies on the Isotopic Composition of Interstellar Grains in Allende: 1. Diamonds*

Ash R. D.\* Arden J. W. Grady M. M. Wright I. P. Pillinger C. T.

*Further Studies on the Isotopic Composition of Interstellar Grains in Allende: 2. Carbon Associated with Spinel*

Virag A.\* Zinner E. Lewis R. S. Tang M.

*Isotopic Compositions of H, C, and N in C-δ Diamonds from the Allende and Murray Carbonaceous Chondrites*

Bernatowicz T.\* Gibbons P. Lewis R.

*Meteoritic Diamonds: Nature of the Amorphous Component*

Wiemer R.\* Baur H. Signer P. Lewis R. S. Anders E.

*Planetary Noble Gases in "Phase Q" of Allende: Direct Determination by Closed System Etching*

Clayton R. N. Mayeda T. K.

*Oxygen Isotopes in Carbonaceous Chondrites*

Weinbruch S.\* Zinner E. K. El Goresy A. Palme H.

*Oxygen-Isotopic Compositions of Individual Forsterite Grains, Fayalitic Rims, and Matrix Olivines from the Allende Meteorite*

McSween H. Y., Jr.\* Grimm R. E.

*Carbonaceous Chondrite Parent Bodies. I: Constraints and Formulation of Thermal Models*

Grimm R. E.\* McSween H. Y. Jr.

*Carbonaceous Chondrite Parent Bodies II: Results and Implications of Thermal Models*

Steele I. M.\*

*Forsterite in CI Meteorites and Interplanetary Dust: Minor Elements and Comparison with Other Meteorite Types*

Johnson C. A.\* Prinz M. Weisberg M. K. Clayton R. N. Mayeda M. K.

*Dark Inclusions in Allende, Vigilante, and Leoville: Implications for Oxidation Prior to Final Accretion of CV3 Parent Bodies*

Hartmetz C. P.\* Blanford G. E. Gibson E. K. Jr.

*In Situ Analysis of Volatile Elements and Molecules in Carbonaceous Chondrites*

Zolensky M. E.\* Barrett R. A. Prinz M.

*Petrography, Mineralogy and Matrix Composition of Yamato-82162, a New C12 Chondrite*

Paul R. L. Lipschutz M. E.\*

*Carbonaceous Chondrites from Queen Maud Land, Antarctica: Glimpses of New Parents*

**POSTER PRESENTATION**

Zolensky M. Barrett R. Gooding J.

*Matrix and Rim Compositions Compared for 13 Carbonaceous Chondrite Meteorites and Clasts*

**PRESENTED BY TITLE ONLY**

Frisenko A. V. Baryshnikova G. V. Guzhova A. V. Lavrukhina A. K.

*The Assemblage of AL-rich Pigeonite with Cristobalite in the Metal Particle from the Efremovka CV Chondrite*

Geiger Th. Metzler K. Bischoff A. Arndt J.

*Annealing Experiments on Allende (CV3): Textural and Mineralogical Modifications*

Geiger Th. Bischoff A.

*(Os,Ru,Ir)S<sub>2</sub> and Other Refractory Siderophile Element-rich Particles in the Metamorphosed Carbonaceous Chondrites Karoonda, Mulga (West), and PCA 82500*

Ivanov A. V. Ivanov B. A.

*The Kaïdum Meteorite: Estimation of the Impact Velocity of the Meteorite Parent Bodies*

Kashkarov L. L. Korotkova N. N. Kashkarova V. G. Skripnik A. Ya.  
*Thermoluminescence Characteristics of Kaidun Carbonaceous Chondrite Minerals*

Matsuda I. Fukunaga K. Ho K.  
*Fractionation of Noble Gases in Vapor-Growth Diamonds*

Moroz L. V. Zinov'yeva N. G. Basilevsky A. T.  
*Degree of Chemical Homogeneity of Carbonaceous Chondrites as Possible Analogs of Phobos Material*

Steele I. M.  
*Cathodoluminescence Mineralogy of Meteorites*

Yajima H. Matsuda I.  
*Noble Gases in Shock-Produced Diamond*

**Monday, March 13, 1989**  
**SHOCK METAMORPHISM AND TERRESTRIAL CRATERS**  
1:30 p.m. Gilruth 206

Sbarpton V. L.\* Schuratz B. C.  
*On Reported Occurrences of Shock-Deformed Clasts in the Volcanic Ejecta from Toba Caldera, Sumatra*

Grothues J. Hornemann U. Stöffler D.\*  
*Mineralogical Shock Wave Barometry: (I) Calibration of Refractive Index Data of Experimentally Shocked Alpha-Quartz*

Grothues J. Deutsch A. Hornemann U. Stöffler D.\*  
*Mineralogical Shock Wave Barometry: (II) Applications to Experimentally Shocked Gneiss*

Boslough M. B.\* Cygan R. T. Kirkpatrick R. J. Montez B.  
*NMR Spectroscopic Analysis of Experimentally Shocked Quartz and the Formation of Diaplectic Glass*

Bottomley R. J.\* York D.  
*The Dating of Impact Melt Rocks Using the  $^{40}\text{Ar}/^{39}\text{Ar}$  Method*

Deutsch A.\* Schärer U. Hornemann U.  
*Response of U-Pb Systematics to Shock-Wave Metamorphism II: 35.0-59.0 GPa Shock-Recovery Experiments on Zircon and Titanite*

Schafer U. Deutsch A.\*  
*Response of U-Pb Systematics to Shock-Wave Metamorphism I: Accessory Minerals in the Haughton Impact Structure, Devon Island, Arctic Canada*

Gavin J. B.\* Bulton J. L. Campbell B. Zisk S.  
*Terram Analysis of the Meteor Crater Ejecta Blanket*

Nishiizumi K.\* Kohl C. P. Shoemaker E. M. Arnold J. R. Lal D. Klein J. Fink D. Middleton R.  
*In Situ  $^{10}\text{Be}-^{26}\text{Al}$  Exposure Ages at Meteor Crater, Arizona*

Grant J. A.\* Schultz P. H.  
*The Erosional State and Style of Meteor Crater, Arizona*

Schultz P. H.\* Grant J. A.  
*Styles of Ejecta Emplacement, Meteor Crater*

Shoemaker E. M.\* Shoemaker C. S.  
*Geology of the Connolly Basin Impact Structure, Western Australia*

Shoemaker E. M.\* Shoemaker C. S. Plescia J. B.  
*Gravity Investigation of the Connolly Basin Impact Structure, Western Australia*

See T. H.\* Mittelfehldt D. W. Hörr F.  
*Analysis of Aeroballistically Dispersed Glass Samples from Wabar Crater, Saudi Arabia*

Wichman R. W.\* Schultz P. H.  
*Loss of Large Craters in the Terrestrial Impact Record*

Strom R. G.\*  
*Are Asteroids the Source of the Period of Late Heavy Bombardment in the Inner Solar System?*

**POSTER PRESENTATIONS**

Alexopoulos J. S. Owen M. R. Greeley R. A. F.  
*Cathodoluminescence and Microscopic Lamellar Features in Quartz from the K/T Boundary and Other Environments: Implications for Their Origin*

- Bohor B. F. Betterton W. J. Jablonski D. Chen C. Z.  
*Permian-Triassic Boundary Clay in China is Volcanic, Not Impact Ejecta*
- Duane M. J. Reimold W. U.  
*The Simpson Desert Depression — An Ancient Impact Basin?*
- Gaffney E. S.  
*Two-Dimensional Gauge Interaction Effects for Plane Shocks in Snow*
- Miura Y. Kato T.  
*Different Densities of Diaplectic Plagioclase Crystals Among Meteorites, Lunar Rocks and Terrestrial Impact Craters*
- Murali A. V. Liu Y.-G. Schmitt R. A. Chatterjee S.  
*Chemical Signatures of Infratrappean Sediments of Deccan Traps, India and Their Implications to the K-T Boundary Scenario*
- Pilon J. Grieve R. A. F. Sharpton V. L. Kennedy J. Coderre J.  
*A Ground Probing Radar Survey at Meteor Crater Arizona: First Results*
- Posin S. B.  
*Yield Strengths of Martian Complex Craters*
- Rocchia R. Boclet D. Bonté Ph. Castellarin A. Courtillot V. Jéhanno C. Wenzel F. C.  
*On the Existence of Several Iridium-enriched Layers at the K-T Boundary and in a Jurassic Sequence*
- Tomlinson W. D.  
*A Possible Impact Crater in Tunisia*

#### PRESENTED BY TITLE ONLY

- Alekseev A. S. Smirnova S. B. Nazarov M. A. Badjukov D. D.  
*Paleontological Age of the Kara Impact Event*
- Badjukov D. D. Bazhenov M. L. Nazarov M. A.  
*Paleomagnetism of Impactites of the Kara Impact Crater: Preliminary Results*
- Badjukov D. D. Nazarov M. A. Suponova I. V.  
*Impact Glasses from the Kara and UST-Kara Structures*
- Brockmeyer P. Deutsch A.  
*The Origin of the Breccias in the Lower Onaping Formation, Sudbury Structure (Canada): Evidence from Petrographic Observations and Sr-Nd Isotope Data*
- Fedorova S. P. Sazonova I. V. Stchibletkin S. I. Feldman V. I.  
*Diaplectic Transformation of Hornblende from Puchezh-Katunki Astrobleme, USSR*
- Feldman V. I. Matveeva Yu. B.  
*Experimental Study of Regional Metamorphism of Impactites*
- Masaitis V. L. Mashchak M. S. Selivanovskaya T. V.  
*Parameters of Excavation and Melting Zones of Kara Crater*
- Nazarov M. A. Barsukova L. D. Badjukov D. D. Kolesov G. M. Nizhegorodova I. V. Alekseev A. S.  
*Geology and Chemistry of the Kara and UST-Kara Impact Craters*
- Nazarov M. A. Badjukov D. D. Alekseev A. S.  
*Morphology of the Kara and UST-Kara Impact Craters, USSR*
- Nazarov M. A. Kolesnikov E. M. Badjukov D. D. Masaitis V. L.  
*Potassium-Argon Age of the Kara Impact Event*
- Reimold W. U. Horsch H. Durrheim R. J.  
*The Bronze-Granophyre from the Vredefort Structure — A Review*
- Sazonova L. V.  
*Orthopyroxene of Impact Melts - Indicator of Impact Melt Cooling (Boltysh Astrobleme, USSR)*
- Sazonova L. V. Feldman V. I. Korotayeva N. N.  
*Plagioclase Crystallization Peculiarities in Impact Melts of Boltysh Astrobleme (USSR)*
- Wu S.  
*Geologic Feature of the Duolun Impact Crater, China*
- Valter A. A. Kolesov G. M. Sapozhnikov D. Y. Miklshansky A. Z.  
*The Distribution of Meteoritic Material in Impactites from the Terny Astrobleme (Krivor' Rog, Ukr. SSR)*

Vrána S.

Petrology and Chemistry of Probable Impact Melt Rocks at the Sevetin Crater

Monday, March 13, 1989

PLANETARY DIFFERENTIATION

1:30 p.m. Bldg. 30 Auditorium

Taylor G. J.\*

Metal Segregation in Asteroids

Newsom H. E.\*

The Nickel Content of the Lunar Core

Kadik A. A. Holloway J. R.\*

Nickel and Cobalt Partitioning Between Silicate and Metal Liquids in the Presence of Graphite at Ten Kilobars

Bertka C. M.\* Holloway J. R.

Martian Mantle Primary Melts: An Experimental Study of Melt Density and Viscosity at 23 kb

McFarlane E. A.\* Drake M. J. Gasparik T.

Partitioning of Ni, Co, Sc, La, and Other Elements Between Olivine and Natural Basaltic Melt at 75 Kbars and 1800°, and Implications for the Early Thermal History of the Earth

Musselwhite D. S.\* Drake M. J. Swindle T. D.

Early Outgassing of the Earth's Mantle: Implications of Mineral/Melt Partitioning of I

Warren P. H.\*

Volumes and Compositions of Crusts Stable over Primordial Silicate Magmaspheres: Effects of Planet Size and FeO Content

Tonks W. B. Melosh H. J.

Crystal Sealing in a Vigorously Convecting Magma Ocean

Turner G.\* Burgess R.

Volatile Enriched Mantle Fluids in Diamond

Tyburczy J. A.\* Krishnamurthy R. V. Epstein S. Ahrens T. J.

Hydrogen Isotopic Fractionation During Impact: Serpentine, Isotopically Enriched Serpentine, and Murchison

Matsui T.\* Tajika Etsuji

Coupled Evolution of the Atmosphere-Ocean, Continent and Interior

PRESENTED BY TITLE ONLY

Abe Y.

Surface of a Terrestrial Planet Growing by Planetary Impacts

Bychkov A. M. Polosin A. V.

Change of Structural and Valant State of Fe Ions During Melting of Minerals (Mössbauer Study)

Bychkov A. M. Polosin A. V.

Double Structural Role of Fe<sup>2+</sup> Ions in Carbonate Glasses (Mössbauer Study)

Jones J. H.

Geochemical Modeling of Igneous Fractional Crystallization

Kozak S. J. Schreiber H. D. Reithmiller M. W. Bienert S. E. Webb J. W.

Iron Redox Characteristics and Chemical Oxygen Diffusion in the System Anorthite-Diopside

Lucey P. G. Bell J. F.

An Enstatite Crystal Composition for Mercury

Malkherjee A. B. Bulatov V. Kotelnikov A.

New High P-T Experimental Results on Orthopyroxene-Chrome Spinel Equilibrium and a Revised Orthopyroxene-Spinel Cosmothermometer

Tuesday, March 14, 1989

MARS GEOLOGY

8:30 a.m. Gilruth 104

Mouginis-Mark P.\*

Geologic Rationale for a Mars Rover/Sample Return Mission to Northern Elysium Planitia

Greeley R. Skyeck A.\* Pollack J. B.

Martian Aeolian Features: Comparison with Results from the Global Circulation Model

- Wilkinson M. J.\*  
*Streaking on Earth and Mars*
- Bridges N.\* Barlow N.  
*Variation of Martian Rampart Crater Ejecta Lobateness in Comparison to Latitude, Longitude, Terrain, and Crater Diameter*
- Craddock R. A.\* Greeley R. Christensen P. R.  
*Evidence for an Ancient Impact Basin in Daedalia Planum, Mars*
- Frey H.\* Schultz R. A.  
*Overlapping Large Impacts and the Origin of the Northern Lowlands of Mars*
- McGill G. E.\*  
*Geologic Evidence Supporting an Endogenic Origin for the Martian Crustal Dichotomy*
- Craddock R. A.\* Maxwell T. A.  
*Timing of Resurfacing Events in the Amenthes and Tyrrhena Cratered Highlands of Mars*
- Maxwell T. A.\* Craddock R. A.  
*Mechanisms of Resurfacing in the Amenthes and Tyrrhena Cratered Highlands of Mars*
- Frey H.\* Grant T. D.  
*Resurfacing in Coprates and Thickness of the Ridged Plains*
- Scott D. H.\* Dohm J. M.  
*Chronology and Global Distribution of Fault and Ridge Systems on Mars*
- Golombek M. P.\*  
*Geometry of Stresses Around Tharsis on Mars*

#### POSTER PRESENTATIONS

- Campos-Marquetti R. Jr. Robars J. Harrington M.  
*Geologic Map of the Ulysses Rupes Area of Mars Australis, Mars*
- Campos-Marquetti R. Jr.  
*A Dune Classification Scheme for Mars: Southern Hemisphere Eolian Bedforms*
- Craddock R. A. Zimbelman J. R.  
*Yorktown and Lexington as Viewed by the Viking 1 Lander*
- De Hon R. A.  
*Geologic Map of Maja Valles: MTM 20057, Northern Lunae Planum, Mars*
- Dimitriou A. M.  
*Geologic Evolution of the Highland/Lowland Transition Zone in the Ismenius Lacus Quadrangle, Mars*
- Melandrez D. E.  
*The Geomorphology of Eastern Gangis Chasma Within Valles Marineris, Mars*
- Peulvast J.-P. Costard F. M.  
*1/500,000 Geomorphological Mapping of Mars: Melas Chasma, Valles Marineris*
- Rice J. W., Jr.  
*The Geology of the Maja Valles Region, Mars (MTM 20052)*
- Rotto S. L. Tanaka K. L.  
*Faulting History of the Alba Patera-Ceraunius Fossae Region of Mars*
- Zimbelman J. R.  
*Erosional Outliers of Dust Along the Southern Margin of the Tharsis Region, Mars*
- Zimbelman J. R.  
*Geologic Mapping of Southern Mangala Valles, Mars*

#### PRESENTED BY TITLE ONLY

- Jöns H.-P.  
*Belts of Embryonic Collisional Mountain Ranges in the Vicinity of the TaNoVa-Updoming, Mars?*
- Jöns H.-P.  
*Suspected Block/Plate Boundaries Within the Mega-Aureole of the TaNoVa-Updoming on Mars*
- Lancaster N. Greeley R.  
*Preliminary Estimates of Sediment Volume in the North Polar Sand Seas of Mars*

Tuesday, March 14, 1989  
**BHOLGHATI AND ANGRITE CONSORTIA PLUS PALLASITES**  
8:30 a.m. Gilruth Gym

Reid A. M.\* Buchanan P.

*The Bholghati Howardite Petrography and Mineral Chemistry*

Laul J. C.\* Gossein D. G. Smith M. R.

*The Bholghati Consortium: Chemical Study of the Bholghati Howardite*

Paul R. L. Wang M. S. Lipschutz M. E.\*

*Volatile/Mobile Trace Elements in the Bholghati Howardite*

Swindle T. D.\* Hohenberg C. M. Nichols R. Olinger C. T.

*Parentless Fission Xenon in the Meteorite Bholghati?*

Bogard D. D.\* Garrison D. H.

*$^{39}\text{Ar}$ - $^{40}\text{Ar}$  Ages of Euclines: Did the HED Parent Body Experience a Long Period of Thermal Events Due to Major Impacts?*

Nyquist L. E.\* Wiesmann H. Bansal B. Shih C.-Y.

*Rb-Sr Age of an Eucritic Clast in the Bholghati Howardite and Initial Sr Composition of the Lewis Cliff 86010 Angrite*

McKay G.\* Le L. Wagstaff J.

*Is Unique Achondrite LEW 86010 a Crystallized Melt?*

Crozaz G.\* McKay G.

*Almager and Trace Element Microdistributions in Angra dos Reis and Lewis Cliff 86010: Similarities and Differences*

Mittlefehldt D. W.\* Lindstrom M. M. Lindstrom D. J.

*Geochemistry of LEW 86010 and Angra Dos Reis and Constraints on the Genesis of the Angrites*

Lugman G. W. Galer S. J. G.\* Ross R.

*Rb-Sr and Other Isotope Studies of the Angrite LEW 86010*

Sherman S. B.\* Treiman A. H.

*The Olivine-Passite Liquidus: Experiments and Implications for Angrite Achondrites and Ca-Al Chondrules*

Righter K.\* Arculus R. J. Delano J. W.

*Redox Equilibria in Pallaside Meteorites and the Eucrite Parent Body (EPB)*

Davis A. M. Olsen E. J.\*

*The Origin of Phosphate Minerals in the Eagle Station and Springwater Pallasites*

**POSTER PRESENTATIONS**

Zhang J. Williams, D. B. Goldstein J. I.\*

*Tetrataenite in the Plessite of the Iron Meteorite Carlton*

Zolensky M. E.\* Barrett R. A.

*CI1, CI2 and CAI2 Clasts in the Bholghati Howardite and the AL Rais Chondrite*

**PRESENTED BY TITLE ONLY**

Kallemeyn G. W. Warren P. H.\*

*Geochemistry of the LEW 86010 Angrite*

Mayeda T. K. Clayton R. N.

*Oxygen Isotopes in the Bholghati Howardite*

McKay G.\* Le L. Wagstaff J.

*Redox Conditions During the Crystallization of Unique Achondrite LEW 86010*

Tuesday, March 14, 1989

**COSMIC DUST II**

8:30 a.m. Gilruth 206

Koeberl C.\* Hagen E. H. Faure G.

*Extraterrestrial Spherules from Glacial Sediment in Antarctica: Internal Structure, Mineralogy, and Chemical Composition*

Maurette M.\* Brownlee D. E. Schramm L. S.

*Giant Micrometeorites from Antarctic Blue Ice*

- Blake D.\* Fleming R. H. Bunch T. E.  
*Identification and Characterization of a Carbonaceous, Titanium Containing Interplanetary Dust Particle*
- Sutton S. R.\* Flynn G. J.  
*Trace Element Compositions of Interplanetary Dust and Terrestrial Particles Collected from the Stratosphere*
- Zolensky M. E.\* Lindstrom D. J. Thomas K. L. Lindstrom R. M. Lindstrom M. M.  
*Trace Element Compositions of Six "Chondrite" Stratospheric Dust Particles*
- Maurette M. Olinger C.\* Walker R. Hohenberg C.  
*Noble Gas Measurements of Extraterrestrial Particles from Polar Sediments*
- Nier A. O.\* Schlutter D. J.  
*Helium and Neon Isotopes in Stratospheric Particles*

#### **PRESENTED BY TITLE ONLY**

- Anufriev G. S. Boltenkov B. S. Kapitonov I. N.  
*He, Ne and Ar Isotopes in the Deep-Sea Oceanic Ferromanganese Nodules*
- Laurance M. R.  
*Intact Capture of Hypervelocity Particles in Aerogels*
- McDonald R. A. Tanner W. G. Alexander W. M.  
*A Description of a Possible Coupling Between Dust Grains and Water-Based Ions in Comet P/Halley*
- Maurette M. Jourdet C. Bonny Ph. Bradley J. P. Germany M. S. Kihl Y.  
*Electron Microscope Studies of Carbon-rich Grains in a New Collection of Antarctica Micrometeorites*
- Maurette M. Passoja D. E.  
*Scatter Plots of Elemental Abundances in Micrometeorites: A Non Statistical Interpretation*
- Maurette M. Pourchet M. Bonny Ph. de Angelis, M. Siry P.  
*A New Collection of Micrometeorites, Extracted from 100 Tons of Artificially Melted Blue Ice, Near Cap-Prudhomme in Antarctica*
- Misawa K. Ma S. L. Yamakoshi K. Nogami K. Nakamura N.  
*Rare Earth Element Abundances in Individual Magnetic, Stony Spherules from Deep-Sea Sediments*
- Rietmeijer F. J. M. Albrecht A.  
*Preparation of Cosmic Dust Analogs for Shock Metamorphism*
- Wu L. Chou P. C.  
*Finite Element Simulation of Intact Capture of Hypervelocity Particles in Multiple Films*
- Zolensky M. Barrett R. Horz L. Cardenas F. Davidson W. Haynes G. Criswell W. Koonz S.  
*The Utility of Silica Aerogel as a Cosmic Dust Capture Medium on the Space Station*

**Tuesday, March 14, 1989**  
**INTERSTELLAR GRAINS/DUST**  
**10:15 a.m. Gilruth 206**

- Clayton D. D.\*  
*Origin of Xe-HL and Supernova 1987A*
- Swan P. S. Walker R. M.\* Yuan J.  
*Location of Small SiC Crystals in Meteorites Using a Low-Voltage X-ray Mapping Technique*
- Clayton D. D. Liffman K. Scowen P.\*  
*16O Anomalies in Interstellar Dust Size Fractions*
- Kerridge J. F.\*  
*Deuterium Enrichments and Synthesis of Meteoritic Organic Matter*
- Reedy R. C.\*  
*Cosmogenic-Nuclide Production Rates in Interstellar Grains*
- Harper C. L.\*  
*Geochronological Investigations in Superstring Cosmology*

Tuesday, March 14, 1989  
MARS: WATER, CANYONS, AND LIFE  
1:30 p.m. Gilruth 104

Clifford S. M.\*

*The Response of an Early Martian Groundwater System to the Onset of a Colder Climate*

Oberbeck V. R.\* Fogelman G.

*On the Possibility of Life on Early Mars*

Squyres S. W.\*

*Early Mars: Warm and Wet, or Just Wet?*

Parker T. J.\*

*Channels and Valley Networks Associated with Argyre Planitia, Mars*

Pieri D.\* Schneeberger D.

*Erosional Land Forms at Alba Patera*

Shaller P. J.\* Murray B. C. Albee A. L.

*Subsurface Landslides on Mars?*

Davis P. A.\* Golombek M. P.

*Discontinuities in the Shallow Martian Crust*

Robinson M. S.\* Tanaka K. L.

*Hydrology of a Flow Event in Kasei Valles, Mars*

Costard F. M.\*

*Fluvio-Thermal Erosion on Mars: A Siberian Analogy*

Williams S. W.\* Zimbelman J. R.

*Origin of Ichnis Flow Material: Ymenitis Lacus, Mars*

Schultz R. A.\*

*Structural Mapping and Interpretation of Valles Marineris, Mars*

Lucechitta B. K. Bertolini L. M.

*Interior Structures of Valley Marineris, Mars*

Croft, S. K.\*

*Canyon Structure in the Hebes-Juventae-Gangis Area, Mars*

POSTER PRESENTATIONS

Cabrol N. A.

*Morphological Variations and Evolution of Channels on Mars*

De Hon R. A.

*Flood Surge in Martian Outflow Systems: Episodic Flow*

Gulick V. C. Baker V. R.

*The Role of Hydrothermal Circulation in the Formation of Fluvial Valleys on Mars*

Kochel R. C. Miller S. M. O.

*Morphological Distinction of Sapping- and Runoff-Dominated Valley Networks on Earth and Mars*

McGehee K. A. Sehumm S. A. Robinson R. S.

*Martian Outflow Channel Formation by Water Erosion Under Nonequilibrium Conditions*

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Costard F. M.

*Asymmetric Distribution of Volatiles on Mars*

Kuzmin R. O. Burba G. A. Bobina N. N. Shashkina V. P. Zabalueva E. V.

*Martian Cryolithosphere: Mapping of Vertical Section Types*

Mouginis-Mark P.

*Recent Water Release in the Tharsis Region of Mars*

Schneeberger D. M.

*Episodic Channel Activity at Ma'Adim Vallis, Mars*

Shukla M. Venkatachala B. S. Sharma M.

*Interaction of Lithosphere and Biosphere: Some Evidences from Early Metazoa and Metaphytes from India*

Tuesday, March 14, 1989

**UREILITES, UNGROUPED CHONDRITES & NEBULAR PROCESSES**  
1:30 p.m. Gilruth Gym

Takeda H.\*

*Pyroxene Chemical Variations of Heavily Shocked Ureilites and the Planetesimal-Scale Collision Model for the Ureilite Genesis*

Aylmer D. Herzog G. F.\* Vogt S. Middleton R. Fink D. Klein J.  
*Beryllium-10 and Aluminum-26 Contents of Ureilites*

Tomeoka K.\* Takeda H.

*Fe-S-Ca-Al-Bearing Carbonaceous Veins in the Yamato-74130 Ureilite: Evidence for the Genetic Link to Carbonaceous Chondrites*

Davis A. M.\* Prinz M.

*Trace Elements in Feldspathic Clasts in Polymict Ureilites*

Brearley A. J.\* Prinz M.

*Phyllosilicate Minerals in Carbonaceous Chondrite Matrix Clasts in the Nilpena Polymict Ureilite: Evidence for a CI-like Chondrite-Ureilite Connection*

Scott E. R. D.\* Newsom H. E.

*Planetary Compositions - Clues from Small Bodies and the Sun*

Wasson J. T.\*

*Antarctic Meteorites: Anomalous Abundance of Ungrouped Irons*

Rubin A. E.\* Kallemeyn G. W.

*A Unique Chondrite Grouplet: Petrology and Chemistry of Carlisle Lakes 001 and Allan Hills 85151*

Weisberg M. K.\* Prinz M. Nehru C. E. Clayton R. N. Mayeda T. K.  
*ALH85151 and Carlisle Lakes 001: Members of a New Chondrite Group*

Prinz M.\* Weisberg M. K. Nehru C. E. MacPherson G. J. Clayton R. N. Mayeda T. K.  
*Petrologic and Stable Isotope Study of the Kakangari (K-Group) Chondrite: Chondrules, Matrix, CAIs*

Grady M. M. Pillinger C. T.

*Nitrogen and Carbon in ALH 85085 - Links with Bencubbin?*

Gosselin D. C.\* Lau J. C.

*Chemistry of Allan Hills 85085: Characterization of a Unique Chondrite*

Eugster O.\* Niedermann S. Wang D.

*Unusual Meteorites LEW86010 and ALH85085 and Eleven Chondrites: Characterization from Cosmogenic and Trapped Noble Gases and Mineralogy*

**PRESENTED BY TITLE ONLY**

Berkley J. L.

*Precision Minor Element Analyses in Silicate Minerals in Ureilites*

Bischoff A. Metzler K. Stöffler D. Palme H. Spettel B.  
*Mineralogy and Chemistry of the Anomalous Chondritic Breccia ALH 85085*

Cassidy W. A.

*Estimating Relative Abundances of Meteorite Types*

Goodrich C. A. Patchett P. J. Drake M. J.

*Nd Isotopic Analyses of Ureilites: Evidence for Mixing of a 4.55 Ga Component with a Younger Component*

Miyamoto M. Nishimura Y. Matsuda J. Ito K.  
*Raman Spectra of Ureilite Diamonds*

Saito J. Takeda H.

*Mineralogical Study of LEW85328 Ureilite*

Weisberg M. K. Prinz M. Nehru C. E.

*Evidence for a Relationship Between Bencubbin, ALH85085 and CR Chondrites*

Tuesday, March 14, 1989  
LUNAR GEOLOGY, PROCESSES AND RESOURCES  
1:30 p.m. Gilruth 206

- Hood L. L.\* Huang Z.  
*Effects on Ambient Magnetic Fields and Plasma of the Expanding Vapor Cloud Produced in Lunar Basin-Forming Impacts*
- Spudis P. D.\* Hawke B. R. Lucey P. G.  
*The Lunar Crisium Basin: Geology, Rings, and Deposits*
- Clark P. E.\*  
*The Relationship Between Orbital and Sample Data for Lunar Landing Sites*
- Jaumann R.\* Neukum G.  
*Spectrophotometric Analysis of the Lunar Plinius Apollo 17-Region*
- Pieters C. M.\*  
*Compositional Stratigraphy of the Lunar Highland Crust*
- Lucey P. G.\* Hawke B. R.  
*Telescopic Thermal Infrared Measurements of the Silicate Mineralogy of Lunar Red Spots*
- Coombs C. R.\* Hawke B. R.  
*Kauhako Crater and Channel, Kalaupapa, Molokai, Hawaii: A Terrestrial Analog to Lunar Sinuous Rilles*
- Oberst J.\* Nakamura Y.  
*A New Estimate of the Meteoroid Impact Flux on the Moon*
- Haskin L. A.\*  
*The Moon as a Practical Source of Hydrogen and Other Volatile Elements*
- Heiken G. H.\* Vaniman D. T.  
*Petrography of Lunar Ilmenite Resources*
- Hawke B. R.\* Coombs C. R. Clark B.  
*Pyroclastic Deposits: an Ideal Lunar Resource*
- Oder R. R.\* Taylor L. A. Keller R.  
*Magnetic Characterization of Lunar Soils*

POSTER PRESENTATION

- Chevrel S. Pinet P.  
*Lunar Mare-Highland Horizontal Spectral Variations from Telescopic CCD-Imaging*
- Clark P. E. Hawke B. R.  
*The Lunar Farside Revisited: East of Smythii and Beyond*
- Clarke F. C. Famale F. P.  
*Galileo Spacecraft Encounters with the Earth/Moon System*
- Coombs C. R. Hawke B. R. Lucey P. G. Head J. W.  
*Geologic and Remote Sensing Studies of the Alphonsus Crater Region*
- Hawke B. R. Lucey B. G. Spudis P. D. Owensby P. D.  
*Impact Structures as Crustal Probes: A Summary of Recent Progress*
- Lumme K. Peltoniemi J. I. Irvine W. M.  
*Derivation of an Average Single Particle Phase Function for the Lunar Regolith*
- Kozlowski R. W. Sprague A. L. Lebofsky L. A.  
*Comparison of the Thermal Emission Spectra from the Surfaces of Mercury and the Moon*
- Ledlow M. Burns J. Zhao J. H. Gisler G. Zeilik M. Baker D.  
*Earth-based Radio Observations of the Planet Mercury*
- Lucey P. G. Granahan J. Nelson M. L. Hawke B. R.  
*A Spectral Mixing Model Approach to the Analysis of the Spectra of Lunar Soils*
- Lucey P. G. Hawke B. R.  
*Imaging Spectroscopy of the Central Highlands from .7 to 1.00  $\mu$ m*
- Lucey P. G. Nelson M. Granahan J. Hawke B. R.  
*The Dependence of Near-Infrared Spectral Parameters on Lunar Rock Type Composition*

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Campbell B. A. Hawke B. R. Bell J. F. III Zisk S. H.

*The Bessel Ray Region: Preliminary Analysis of Remote Sensing Data*

Colson R. O. Haskin L. A.

*Some Effects of Composition on Efficiencies for Production of O<sub>2</sub> and Fe<sup>0</sup> from Silicate Melts by Electrolysis*

Houdashelt M. L. Bustin R. Gibson E. K. Jr.

*Hydrogen Extraction from Lunar Soil: Methods Applicable to a Lunar Processing Facility*

Pugacheva S. G.

*Regionalization of the Moon's Surface Based on the Thermal Radiation in the IR Region of the Spectrum (10-12 Microns)*

Rodionova Zh. F. Shevchenko V. V.

*Distribution of Craters with Central Peaks and with Hills and Ridges at Bottom over the Lunar Surface*

**Tuesday, March 14, 1989**

**OPPORTUNITIES IN SOLAR SYSTEM EXPLORATION**

8:00 p.m. Building 2 Auditorium

L. Fisk, NASA Headquarters  
*OSS Strategic Plans*

V. Barsukov, Vernadsky Institute  
and

S. Keller, NASA Headquarters  
*Review of Bi-lateral Discussions*

**Wednesday, March 15, 1989**

**VENUS GEOPHYSICS**

8:30 a.m. Gilruth 104

Fletcher R. C.\*

*Implications of Folding for the Rheological Structure of the Crust of Venus*

Solomon S. C.\* Head J. W.

*Lithospheric Flexure Beneath the Frevia Momes Foredeep, Venus: Constraints on Lithospheric Thermal Gradient and Heat Flow*

Williams D. R.\* Greeley R.

*Stress Distribution on Tellus Regio, Venus, Inferred from Gravity and Topography*

Smrekar S.\* Phillips R. J.

*Implications of Gravity Modelling for a Thermal Isostasy Hypothesis for Bell Region, Venus*

Black M. T.\* Zuber M. T. McAdoo D. C.

*Comparison of Observed and Predicted Gravity Profiles over Aphrodite Terra, Venus*

Sotin C.\* Senske D. Head J. W. Parmentier E. M.

*Analysis of Topography and Line of Sight (LOS) Accelerations over Western Aphrodite: Evaluation of a Spreading Cemeter Model*

Phillips R. J.\*

*Tectonic Response to Mantle Dynamics in Venus*

Kiefer W. S.\* Hager B. H.

*The Role of Mantle Convection in the Formation of Highland Regions on Venus*

McGovern P. J.\* Solomon S. C.

*Influence of Volatile Loss on the Mantle Temperature of Venus*

Stofan E. R.\* Head J. W.

*Coronae of Mnemosyne Regio, Venus: Morphology and Origin*

Schubert G.\* Bercovici D. Thomas P. J. Campbell D. B.

*Venus Coronae: Formation by Mantle Plumes*

Hess P. C.\* Head J. W. Parmentier E. M.

*Melting of Venusian Mantle at Spreading Cemers*

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Bindschadler D. I. Parmentier E. M.

*Mantle Flow Tectonics and a Weak Lower Crust: Implications for Formation of Large-scale Features on Venus*

Pronin A. A. Borozdin V. K.

*Arachnoids on Venus: Plausible Mechanism of Formation*

Slyuta E. N. Kudrin L. V.

*The Rehe Structure of Rotational Stress Field on Venus?*

**Wednesday, March 15, 1989**

**CAIs**

**8:30 a.m. Gilmouth Gym**

Palme H.\* Hutcheon I. D. Spettel B.

*The Bulk Composition of "Fremdlinge" from a Ca-Al-rich Allende Inclusion*

Paque J. M.\*

*Vanadium-rich Refractory Platinum Metal Nuggets from a Fluffy Type A Inclusion in Allende*

Croazat G. MacPherson G. J.\* Lundberg L. I.

*Rare Earth Element Distribution in a Complex Type BI Allende Inclusion, an Ion Microprobe Study (Revisited)*

Zinner E. K.\* Caillet C. El Goresy A.

*Mg- and O-Isotopic Compositions of Periclaste, Spinel, and Melilite from Vigorano CAI 477B*

Ireland T. R.\* Fahey A. J. Zinner E. K.

*Isotopic and Chemical Constraints on the Formation of HAl-type Refractory Inclusions*

Podosek F. A.\* Brannon J. C. MacPherson G. J. Fahey A. Lundberg L. Zinner E. K.

*Comparison of 26Al and Initial  $^{87}\text{Sr}/^{86}\text{Sr}$  Systematics in Allende CAIs*

Brigham CAI\* Hutcheon I. D. Wasserburg G. J.

*A Petrographic and Isotopic Study of Major Phases and Opaque Assemblages in an Allende Fun Inclusion*

Kennedy A.\* Hutcheon I. D. Wasserburg G. J.

*Chemical and Isotopic Constraints on the Formation and Evolution of SA-1, a Basaltic CAI from Allende*

Keller J. P.\* Buseck P. R.

*Alteration of Ca- and Al-rich Inclusions in Allende: A Transmission Electron Microscope Study*

Fegley B. Jr. Kong D.\*

*Mo and W Depletions in CAIs in Carbonaceous Chondrites: A Theoretical Study of the Effects of Nebular Total Pressure*

Kuehner S. M.\* Laughlin J. R. Grossman L.

*Non-Equilibrium Trace Element Partitioning and Relict Grains in A Type BI CAI*

Boctor N. Z.\* Hutcheon I. D. Wasserburg G. J.

*Petrology and Opaque Mineralogy of an Armalcolite-Bearing Basaltic CAI from the Allende Meteorite*

Armstrong J. T.\*

*Evidence of Post-Accretional Alteration of CAIs in the Vigorano Carbonaceous Chondrite*

**PRESENTED BY TITLE ONLY**

Esat T. M. Taylor S. R.

*Ca Isotope Anomalies in Inclusions from Allende and Murchison Meteorites*

Ulyanov A. A. Deviats A. L. Lasutina E. P. Korovkin M. A. Shukolyukov Yu. A.

*Hydrogen Isotope Abundances in Early Solar System Materials*

Ulyanov A. A. Ustinov V. I. Kononkova N. N. Shukolyukov Yu. A.

*Oxygen Isotopic Anomaly in Metasomatically Altered Refractory Inclusions of Carbonaceous Chondrites*

**Wednesday, March 15, 1989**

**NATURE AND EFFECTS OF IMPACT CRATERING**

**8:30 a.m. Gilmouth 206**

Crawford D. A.\* Schultz P. H. Srnka L. J.

*Magnetic Probing of Early-Time Impact Phenomena*

Vickery A. M.\*

*Jetting and the Origin of Tektites*

Glass B. P.\* Wasson J. T. Furtell D. S.

*A Layered Moldavite Containing Baddeleyite*

- Stecher O.\* Ngo H. H. Papanastassiou D. A. Wasserburg G. J. Jansa L. F.  
*Rb-Sr and Sm-Nd Signatures from the Montagnais and Popigai Impact Craters*
- Ivanov B. A.\*  
*Z-Model with Shear Bulking and Gravity Anomalies Above Impact Craters*
- O'Keefe J. D.\* Ahrens T. J.  
*Planetary Impacts: Effects of Gravity, Size and Velocity on the Scaling of Crater Geometry and the Transition from Simple to Complex Craters*
- Ryan E. V.\* Davis D. R.  
*Collisional Disruption Experiments: Impact Strength Analysis and Velocity Distributions*
- Barlow N. G.\*  
*Implications of the Inner Solar System Cratering Record for the Earth*
- Ryder G.\*  
*Bombardment in the Moon-Earth System 4.5-3.8 Ga Ago: The Lunar Record of Early Quiet and Late Cataclysm*
- Schultz P. H.\* Gault D. E.  
*Protracted Global Catastrophes from Oblique Impacts*
- Huffman A. R.\* Crocket J. H. Gartner S.  
*The Cretaceous-Tertiary Boundary at Brazos River, East Texas*
- Hildebrand A. R.\* Wolbach W. S.  
*Carbon and Chalcophiles at a Nonmarine K/T Boundary: Joint Investigations of the Raton Section, New Mexico*
- Bohor B. F.\* Betterton W. J.  
*Glauconite Spherules and Shocked Quartz at the K-T Boundary in DSDP Site 603 B*

#### PRESENTED BY TITLE ONLY

- Dikov Yu. P. Gerasimov M. V. Yakovlev O. I.  
*Some Peculiarities of Refractory Elements Volatilization from Silicate Melts*
- Goles G. G. Schmitt R. A.  
*Pristine Shatsky Rise K/T Marine Carbonates Yield Negative Ce Anomalies Slightly Higher than Present Pacific Ocean, Implying a Slightly Lower pH of 8.0; IV.*
- Huffman A. R. Carter N. L. Officer C. B.  
*Are Shocked Minerals Unique to Impact?*
- Jin G.-Y. Schmitt R. A.  
*Pristine Shatsky Rise K/T Marine Carbonates Yield  $^{40}\text{NET}/^{41}\text{NET} = \text{CI}$  Chondritic Ratio; No Evidence for Fe from Terrestrial Crater Ejecta Rules out Direct Asteroid-Comet Impact; II. Correlations and Calculations*
- Jin G.-Y. Schmitt R. A.  
*Pristine Shatsky Rise K/T Marine Carbonates Yield  $^{40}\text{NET}/^{41}\text{NET} = \text{CI}$  Chondritic Ratio; No Evidence for Fe from Terrestrial Crater Ejecta Rules out Direct Asteroid-Comet Impact; I. Observations*
- Jin G.-Y. Schmitt R. A.  
*Pristine Shatsky Rise K/T Marine Carbonates Exhibit Anomalous Mn/Al Ratios Relative to Normal Pacific Ocean Carbonates. III.*
- Liu Z. Peng H.  
*Discovery of Neogene Tektites Layer in the Core Collected from North Pacific*
- Matsuda J. Yajima H.  
*Noble Gases in Darwin Glass: Anomalous Neon Enrichment*
- Peng H. Liu Z.  
*A Discovery of Impact Craters on Deep-sea Cosmic Spherule*
- Peng H. Liu Z.  
*Discovery of a Peculiar Flanged Microtektite in Sediment Collected from North Pacific*
- Polosin A. V. Bychkov A. M. Borisov A. A.  
*Temperature-Induced Changes of the Structural State of Iron Ions in Silicate Melts (Mössbauer Study)*
- Schmitz R. A.  
*Cometesimal Explosions in Earth's Atmosphere (CEEA) and Steep Angle Cometesimal Crater (SACC) Events Cause Cretaceous/Tertiary (K/T) Extinction Phenomena. V.*

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**Order Code: R-87-02** MARTIAN GEOMORPHOLOGY AND ITS RELATION TO SUBSURFACE VOLATILES (MECA Special Session at LPSC XVIII). S. Clifford, L. Rossbacher, J. Zimbelman

**Order Code: R-87-03** MARTIAN CLOUDS DATA WORKSHOP. S. Lee

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**20TH ANNIVERSARY PLENARY REVIEW**  
1:30 p.m. Building 2 Auditorium

Wetherill G. W.\*

*Formation of the Moon in the Context of the Origin of the Solar System*

Turner G.\*

*Lunar Chronology*

Ryder G.\*

*Theories of Evolution: an Indefinitive Biography of the Moon*

Spudis P. D.\*

*Stratigraphy and Cratering History of the Moon: Our Understanding 20 Years After Apollo 11*

Geiss J.\*

*Lunar Regolith and Solar History*

**Thursday, March 15, 1989**

**VENUS GEOLOGY**

8:30 a.m. Gilruth 104

Kryuchkov V. P. Basilevsky A. T.\*

*Radar-Bright Flow-like Features as Possible Traces of the Latest Volcanic Activity on Venus*

Schaber G. G.\* Kozak R. C.

*Morphologies of Ten Venusian Shields Between Lat 30° and 90° N*

Roberts K. M.\* Head J. W.

*Lakshmi Planum Volcanism: Style, Origin, and Relation to Other Volcanic Deposits on Venus*

Gaddis L. R.\*

*Estimates of Minimum Lava Flow Eruption Rates on Venus*

Arvidson R. E. Plaut J. J.\* Jurgens R. F. Saunders R. S. Slade M. A.

*Geology of Southern Guinevere Planitia, Venus, Based on Analysis of Goldstone Radar Data*

Campbell D. B.\* Hine A. A. Harmon J. K. Senske D. A. Vorder Bruegge R. W. Fisher P. C. Frank S. Head J. W.  
*New Arecibo High-Resolution Radar Images of Venus: Preliminary Interpretation*

Head J. W.\*

*Venus Tessera as Analogs to Earth Oceanic Crust Formed at Spreading Centers*

Vorder Bruegge R. W.\* Head J. W.

*Multi-Stage Tectonic Evolution of Eastern Ishtar Terra, Venus*

Bindschadler D. L.\* Head J. W.

*Models of Venus Tectonics: Evaluation and Application to Tessera Terrain*

Crumpler L. S.\* Head J. W.

*Eastern Aphrodite Terra, Venus: Evidence for Continuation of Divergent Plate Boundary Characteristics and Crustal Spreading from Diana Chasma to Atla Regio*

Frank S. L.\* Head J. W.

*Spacing of Ridge Belts in the Plains-Ridge Belt Assemblage, Venus*

Basilevsky A. T. Burba G. A. Batson R. M.\*

*Maps of Part of the Venus Northern Hemisphere: A Joint US/USSR Mapping Project*

Ford J. P.\*

*Incidence Angle and Resolution: Potential Effects on Interpreting Venusian Impact Craters in Magellan Radar Images*

**POSTER PRESENTATIONS**

Aubele J. C.

*Characteristics and Geologic/Terrain Associations of Small Dome-like Hills on Venus*

Campbell D. B. Hine A. A. Harmon J. K.

*Venus: New Radar Images*

Edmunds M. S.

*Large Venusian Shields: Characterization and Comparisons*

- Gaddis J. R., Greeley R.  
*Volcanism in NW Ishtar Terra, Venus*
- Jurgens R. F., Ostro S. J., Goldstein R. M., Greiner W.  
*Polarization Radar Cross Sections of Mercury and Venus at 3.53 cm Wavelength*
- Kozak R. C.  
*Clotho Tessera, Venus: A Fragment of Fortuna Tessera?*
- Raitala J., Törmänen T.  
*Coronae Chain on Venus - A Hot Spot Under a Moving Plate?*
- Senske D. A., Head J. W.  
*Synthesis of Venus Equatorial Geology: Variations in Styles of Tectonism and Volcanism and Comparison with the Northern High Latitudes*
- Wall S. D., van Zyl J. J., Saunders R. S.  
*Preliminary Investigation of Empirical and Model Relationships Between Surface Roughness and HH and VV SAR Returns: Implications for Magellan Data Analysis*
- Yewell S. B.  
*Anticipating Magellan: Interpreting Radar Images of Geological Features*

#### PRESENTED BY TITLE ONLY

- Abramov A. V., Grechischev A. V., Zherikhin N. V., Zheltikov I. A., Kreslavsky M. A., Levenko G. M., Morozov A. A.  
*Scattering Properties of Venus Surface Derived from Venera-15, 16 Data*
- Basilevsky A. T., Kryuchkov V. P., Bobina N. N.  
*Areal Distribution of the Latest Volcanic Activity as a Key to Global Tectonic Style: Comparison of Northern Venus and the Pacific*
- Burba G. A.  
*Crater Density in the Northern Part of Venus: Areal and Topographic Patterns*
- Burba G. A., Bobina N. N., Shashkina V. P.  
*Geologic Mapping of the Northern Venus: A Progress Report*
- Burba G. A.  
*Venera 15 and 16 Cartographic Products: A Review*
- Frank S. L., Head J. W.  
*Lukelong Dorsa as a Zone of Underthrusting and Possible Subduction on Venus*
- Head J. W.  
*Basic Assemblages of Geologic Units in the Venus Northern Hemisphere*
- Head J. W., Bruegge R. V., Crumpler L.  
*Architecture of Orogenic Belts and Convergent Zones in Western Ishtar Terra*
- Johnson J. R.  
*Results of a Training Exercise in Geological Mapping and Interpretation of Venus. Venera Map 12*
- Kreslavsky M. A., Basilevsky A. T.  
*Tentative Analysis of RMS Map of Venus Surface Based on Venera 15,16 Measurements: Comparison with Pioneer Venus Data*
- Kreslavsky M. A., Basilevsky A. T.  
*Tentative Analysis of Reflectivity Map of Venus Surface Based on Venera-15, 16 Measurements: Comparison with Pioneer Venus Data*
- Kryuchkov V. P.  
*A System of Conjugate Strike-Slip Faults in the Ridge Belts on Venus*
- Marshall J. R., Fogelman G., Greeley R.  
*Gold Welding of Aeolian Materials in the Venusian Environments: Experimental and Theoretical Considerations*
- Sasaki S.  
*Off-Disk Implantation of the Solar Wind and the Origin of Venusian Ar*
- Senske D. A., Basilevsky A. T., Campbell D. B., Abramov A. V., Grechischev A. V., Levenko G. M., Head J. W.  
*Examination of Radar-bright Deposits Associated with the Crater Voynich Using Venera 15/16 and Pioneer Venus Roughness, Reflectivity, Altimetry, and Imaging Data*
- Senske D., Head J. W.  
*Venus Equatorial Geologic Units*

Sinilo V. P. Slyuta E. N.

*Radarclinometry: Implications for the Morphology of Small Dome-like Hills on Venus*

Stofan E. R. Head J. W.

*Major Characteristics of the Plains-Corona Assemblage, Venus*

Sukhanov A. L.

*Tectonics of North Polar Plains on Venus*

Thursday, March 16, 1989

SNCs, HEDs AND FELLOW TRAVELERS

8:30 a.m. Gilruth Gym

Jagoutz E.\*

*Is the Shergottite EETA 79001 a Breccia?*

Treiman A. H.\*

*Origin of Olivine in the Nakhla Achondrite, with Implications for Distribution of Fe/Mg Between Olivine and Augite*

Johnson M. C.\* Rutherford M. J. Hess P. C.

*Experimental Study of Igneous Kaersutite Stability with Application to SNC Petrogenesis*

Swindle T. D.\* Nichols R. Olinger C. T.

*Noble Gases in the Nakhlite Governador Valadares*

Wentworth S. J.\* Gooding J. L.

*Calcium Carbonate and Silicate "Rust" in the Nakhla Meteorite*

Mittlefehldt D. W.\* Lindstrom M. M.

*Diogenite Petrogenesis: Geochemistry and Petrology of Whole Rocks and Coarse-Grained Separates*

Berkley J. L.\*

*Petrogenetic Relationships Among Eucrite Clasts in LEW85313 Howardite*

Takeda H.\* Tagai T.

*Discovery of Two Antarctic Eucrites with Reference to the HED (Howardite-Eucrite-Diogenite) Association*

Delaney J. S.\*

*The Relationship Between the Lewis Cliff Basaltic Achondrites (1985, 86, and 1987 Series) and Other Polymict Achondrites*

Tera F.\* Carlson R. W. Boctor N. Z.

*Contrasting Pb-Pb Ages of the Cumulate and Noncumulate Eucrites*

Prinzhoffer A.\* Papanastassiou D. A. Wasserburg G. J.

*Sm-Nd Chronology of Differentiation of Small Planets*

Brouxel M.\* Tatsumoto M.

*Age of the Estherville Mesosiderite*

Ganguly J.\* Bose K. Ghose S.

*Fe<sup>2+</sup>-Mg Ordering in Orthopyroxenes and the Cooling Rates of Meteorites*

#### PRESENTED BY TITLE ONLY

Burns R. G.

*Olivine Alteration Phases in Shergottite ALHA 77005: Information from 4.2 K Mossbauer Spectra*

Cruikshank D. P. Tholen D. J. Hartman W. K. Bell J. F. Brown R. H.

*Three Vesta-like Basaltic Asteroids and the Origin of Eucrites*

Mittlefehldt D. W. Lindstrom M. M.

*Geochemistry and Petrogenesis of Mesosiderite Whole Rock Silicates*

Yaroshevsky A. A. Migdisova L. F.

*Eucrite Pomozdino: Chemical and Mineral Composition of Clasts and Matrix: A Correction*

**Thursday, March 16, 1989**  
**REGOLITH**  
**8:30 a.m. Gilruth 206**

Becker R. H.\*

*Solar Wind Gases in a Metal Separate from Lunar Soil 68501*

Kerridge J. F.\* Marti K.

*Nitrogen, Xenon and Argon in Lunar Regolith Breccia 60016: A Study of Solar-wind Nitrogen and Measures of Antiquity*

Korotev R. L.\*

*Geochemical Stratigraphy of the 60009/60010 Core, Apollo 16*

McKay D. S.\* Wentworth S. J.

*Impact Glasses in Apollo 14 Regolith Breccias and the Origin of Soils*

Basu A.\* McKay D. S. Wentworth S.

*Regolith Breccias as Precursors of Present Day Regolith on the Moon*

Jéhanno C. Bolet D. Danon J. Robin E. Rocchia R.\*

*Search for Debris of the Tunguska Meteor: Analytical Study of Spherules from the Explosion Site*

Kashkarov L. L.\* Genaeva L. I.

*Regolith Stage of Meteorites: Track Studies of Pesyanoe Achondrite*

#### **POSTER PRESENTATIONS**

Sprague A. L.

*A Diffusion Source Mechanism for the Atmospheres of Mercury and the Moon*

#### **PRESENTED BY TITLE ONLY**

Muinonen K. Lumme K. Irvine W. M.

*Statistical Photoclinometry and Surface Topography of Atmosphereless Bodies*

Rode O. D. Yakovlev O. I. Romashova T. V.

*Experimental Impacts: Analysis of Ejected Debris*

Simon S. B. Papike J. J. Laul J. C. Hughes S. S. Schmitt R. A.

*Comparative Petrology and Chemistry of Apollo 17 Regolith Breccias*

Wentworth S. J. Lindström D. J. Zolensky M. E. Lindstrom M. M. McKay D. S.

*INAA of Glass Spheres from Ancient Apollo 16 Regolith Breccias*

**Thursday, March 16, 1989**

**COSMIC RAYS**

**10:15 a.m. Gilruth 206**

Rao M. N.\* Padia J. T.

*Proton to Neon Ratio in Ancient Solar Flares Based on Fayetteville and Kapoeta*

Nichols R. H., Jr.\* Hohenberg C. M. Olinger C. T. Goswami J. N.

*Pre-Compaction Irradiation of Individual Grains from Meteoritic Breccias: Exceedingly Long Regolith Histories or An Active Early Sun?*

Michel R.\* Cloth P. Dragovitsch P. Filges D.

*On the Production of Cosmogenic Nuclides in Meteoroids by Galactic Protons*

Mathew K. J. Rao M. N.\* Michel R. Presher K.

*Production of Stable Xenon Isotopes from Barium by Low-Energy Protons*

Mathew K. J. Rao M. N.\* Michel R.

*High Energy Spallation Xenon Spectrum from Barium Targets*

Fireman E. L.\* Beukens R. P.

*Carbon-14 Production by 155-Mev Protons in Meteorites*

Jull A. J. T.\* Donahue D. J. Linick T. W.

*Trends in Carbon-14 Terrestrial Ages of Antarctic Meteorites from Different Sites*

Vogt S.\* Englert P. A. J. Klein J. Fink D. Middleton R.

*Cosmogenic Radionuclides in the Antarctic II5-Chondrites LEW 85319 and LEW 85320*

## POSTER PRESENTATION

Juyl A. J. T. Englert P. A. J. Donahue D. J. Reedy R. C. Lal D.  
*Cosmogenic Nuclide Production Rates: Carbon 14 from Neutron Spallation*

## PRESENTED BY TITLE ONLY

Alexeev V. A.  
*Distributions of Long-lived Cosmogenic Radionuclides in Meteorites*

Reedy R. C. Nishiizumi K. Arnold J. R.  
*Solar Cosmic Rays: Fluxes and Reaction Cross Sections*

Thursday, March 16, 1989  
ORIGIN AND CRYSTALLIZATION OF MARE BASALTS  
1:30 p.m. Gilruth 104

Steele A. M.\* Haskin L. A.  
*Apollo 15 Green Glass: The Range of Chemical Compositions in Individual Formational Events*

Shearer C. K.\* Papike J. J. Simon S. B. Galbreath K. C. Shimizu N.  
*A Comparison of Trace Element Characteristics of Picritic Glass Beads from the Apollo 14 and Apollo 17 Sites: Implications for Basalt Petrogenesis and Compositional Variability in the Lunar Mantle*

Hughes S. S.\* Delano J. W. Schmitt R. A.  
*Trace Element Signatures in Mare Volcanic and Impact-Melt Glasses from Apollo 14, 15, 16 and 17*

Dasch F. J.\* Ryder G. Shih C.-Y. Wiesmann H. Bansal B. M. Nyquist L. E.  
*Time of Crystallization of a Unique A15 Basalt*

Neal C. R.\* Taylor L. A. Hughes S. S. Schmitt R. A.  
*Apollo 17 High-Ti Basalt Petrogenesis: An Integrated Approach Using Whole-Rock Major and Trace Element Analyses*

Neal C. R.\* Taylor L. A. Patchen A. D. Ballington M.  
*Mineralogy and Petrography of 28 New Apollo 17 Basalts*

Brophy J. G. Basu A.\*  
*Clinopyroxene Fractionation from an Initial Lunar Magma and Some EU/Eu\* Calculations*

## POSTER PRESENTATIONS

Colson R. O. Haskin L. A.  
*Use of Stationary Electrode Polarography to Measure Reduction Potentials for Eu<sup>3+</sup> in Melt of Diopsidic Composition*

Engelhardt W. v.\* Arndt F. Pankau H. G. Witzsche A.  
*Abrich Pyroxenes: Metastable Formation in Supercooled Lunar Basaltic and Terrestrial Impact Melts*

Neal C. R.\* Taylor L. A.  
*Apollo 14 High-Alumina Basalt Petrogenesis: Isotope Evidence for Assimilation and Fractional Crystallization (AFC)*

Papike J. J.\* Shearer C. K. Simon S. B. Galbreath K. C. Shimizu N. Yurimoto H. Sueo S.  
*Trace Element Characteristics of Apollo 14 Volcanic and Impact-Generated Glass Beads*

Vetter S. K. Shervais J. W.  
*A Dynamic Melting Model for the Origin of Apollo 15 Olivine-Normative and Quartz-Normative Mare Basalts*

## PRESENTED BY TITLE ONLY

Delano J. W.  
*Buoyancy-Driven Melt Segregation in the Earth's Moon*

Farrand W. H.  
*Highland Contamination and Subsurface Topography in Southern Mare Serenitatis*

Hughes S. S. Delano J. W. Schmitt R. A.  
*Trace Element Chemistries of 74241 and 79221 Mare Volcanic Glasses*

Jin Y. Taylor L. A.  
*Volcanic and Impact Glasses from Mare Fecunditatis*

Neal C. R. Taylor L. A.  
*Definition of a Pristine, Unadulterated urKREEP Composition Using the "K-Frac/REEP-Frac" Hypothesis*

- Neal C. R. Taylor L. A.  
*The Barium Problem in Silicate Liquid Immiscibility: Influence of Melt Composition and Structure on Elemental Partitioning*
- Neal C. R. Taylor L. A. Patchen A. D.  
*The "K-Frac/KREEP-Frac" Hypothesis: Evidence for Both KREEP Components in 12033 Felsite with Post-SLI Fractionation of the REEP-Frac*
- Qi Q. Taylor L. A. Zhou X.  
*Unusual Mantle Xenoliths from Southeast China*
- Semenova A. S. Tarasov L. S. Kononkova N. N. Solovieva N. V.  
*VLT-LT Basalts of Luna 16 and Luna 20: Petrography, Mineralogy and Petrogenesis*
- Shearer C. K. Papike J. J.  
*Is Plagioclase Removal Responsible for the Negative Eu Anomaly in the Source Regions of Mare Basalts?*
- Sherwais J. W. Netter S. K.  
*Melt Rock Components in KREEPy Breccia 15205 — Petrography and Mineral Chemistry of KREEP Basalts and Quartz-Normative Mare Basalts*
- Shih C.-Y. Nyquist L. E.  
*Isotopic and Chemical Constraints on Models of Aluminous Mare Basalt Genesis*
- Shkuratov Yu. G. Bondarenko N. V. Kornienko Yu. V. Stankevich N. P.  
*Lunar Albedo-Color Diagram: Survey of South-West Part of Lunar Disk*
- Tarasov L. S. Kudryashova A. F. Semenova A. S. Baryshev V. B. Zolotarev K. V.  
*Geochemical Identification of VLT-LT Basalts from Mare Fecunditatis and Apollonius Region*
- Tarasov L. S. Kudryashova A. F. Ulyanov A. A. Baryshev V. B. Zolotarev K. V.  
*Geochemistry of Rare Elements in Various Types of Basaltic Rocks from Apollo 17 Samples*
- Thursday, March 16, 1989**  
**ASTEROIDS AND SMALL BODIES**  
**3:00 p.m. Gilruth 104**
- Britt D. T.\* Pieters C. M.  
*Bidirectional Reflectance Characteristics of Black Chondrite Meteorites*
- Lebofsky L. A.\* Jones T. D.  
*The Nature of Low Albedo Asteroids from 3- $\mu$ m Spectrophotometry*
- Villas F.\* Gaffey M. J.  
*Weak Fe<sup>2+</sup> + Fe<sup>3+</sup> Charge Transfer Absorption Features Seen in CM2 Carbonaceous Chondrites and Narrowband Reflectance Spectra of Primitive Asteroids*
- Gaffey M. J.\*  
*The Abundance of Metal on S-Asteroid Surfaces: Indications from IRAS 12 and 25 Micron Flux Ratios*
- Bell J. F.\* Piscitelli J. R. Lebofsky L. A.  
*Dennos: Hydration State from Infrared Spectroscopy*
- Efford N. D.\*  
*Integral Photometry of Phobos Using Hapke's Equation*
- Murchie S. L.\* Head J. W. Efford N. D.  
*Morphologic Classes of Grooves on Phobos*

#### POSTER PRESENTATIONS

- Boice D. C. Huebner W. F. Lambert J. V.  
*A Three-Dimensional Computer Representation of the Nucleus of Comet Halley*
- Cloutis E. A.  
*Olivine-Metal Mixtures: Spectral Reflectance Properties and Phase Determinations*
- Harris A. W.  
*The H-G Asteroid Magnitude System: Mean Slope Parameters*
- McKay C. P. Borucki W. R. Kojirô D. R. Church F.  
*Shock Production of Organics During Cometary Impact*
- Paolicchi P. Cellino A. Davis D.\* Farinella P. Zappalà V.  
*Asteroid Collisional Evolution: The Holistic Approach*

Spohn T. Benkhoff J.  
*Sample Thermal History Models of KOSI Comet Nucleus Simulation Experiments*

**PRESENTED BY TITLE ONLY**

Britt D. T. Pieters C. M. Webb R. S. Pratt S. F.  
*Relationship of C-type Asteroids to Dark Meteorites: Evidence for Optical Alteration by Asteroidal Regolith Processes*

Hartmann W. K. Tholen D. J. Meech K. J. Cruikshank D. P.  
*"Asteroid" 2060 Chiron: Status Report on Probable Cometary Activity*

Hartmann W. K.  
*Phobos: Comparison of Small Craters on Phobos and the Moon*

Helin E. F.  
*Interesting Dynamical Aspects of 1989b, a New Short-Period Comet*

Hiroi T. Takeda H.  
*A Method of Converting Reflectance Spectra into Absorption Coefficient Spectra of Mineral Mixtures for Application to Asteroidal Surface Mineralogy*

Lucey P. G. Bell J. F. Piscitelli J. R.  
*High Spectral Resolution Spectroscopy of the Martian Moons*

Marov M. Ya. Kolesnichenko A. V. Skorov Yu. V.  
*The Model of Heat and Mass Transfer in the Cometary Atmosphere*

Morgan T. H. Kessler D. S.  
*The Average Relative Velocity and Average RMS Relative Velocity of the Meteoroid Population*

Mukhin I. M. Dikov Yu. P. Evlanov E. N. Fomenkova M. N. Nazarov M. A. Prilutsky O. F.  
Sagdeev R. Z. Zubkov B. V.  
*Possible Composition of Halley Comet Dust (Si-poor Particles) According to the Data Obtained by Mass-Spectrometer Puma-2*

Rajan R. S. ReVelle D. O.  
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Lin Y. T. El Goresy A.\* Hutcheon I. D.  
*The First Meteoritic Silver Minerals in Peña Blanca Springs Enstatite Achondrite: Assemblages, Compositions and Silver Isotopes*

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*Long Wavelength Stress Models for Mars: New and Improved*

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*Planetary Response of Thick Lithospheres to Loading*

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*Mantle Convection and the Thermal Evolution of Mars*

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*Formation of Antipodal Terrains on Icy Satellites*

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*Covariance and Harmonic Analysis of the Interaction of Lunar Gravity and Its Surface Characteristics*

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*Is Natural Silicate Liquid Immiscibility Metastable?*

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*A Granite Fragment from the Apennine Front—Brother of QMD?*

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*Mineralogy of the Ferroan Anorthosite Suite: Clues to the Parent Magma Puzzle*

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*Planetary Accretion Studies: Effects of Numerical Parameters*

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*Giant Impact Theory of the Moon's Origin: First 3-D Hydrocode Results*

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*Intact Planetoid Capture: Application to Planets Venus and Earth*

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*Disc Tides and the Formation of Giant Planet Cores*

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*Planetesimal Swarms Perturbed by a Distant Protoplanet*

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*Gravitational Stirring of Planetesimals by a Planetary Embryo: Implications for Runaway Growth*

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*Numerical N-Body Simulation of the Accretional Process of the Terrestrial Planets*

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*Statistical Evolution of Impact Ejecta from Earth—Implication for Transfer to Other Solar System Bodies*

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- Murchie S. L. Head J. W. Plescia J. B.  
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de Angelis, M.	Cosmic Dust II, Tues. a.m., Rm. 206	Fegley B. Jr.	Shock Metamorphism & Terres. Craters, Mon. p.m., Rm. 206
De Hon R. A.	Mars Geology, Tues. a.m., Rm. 104	Feldman V. I.	CAI's, Wed. a.m., Gym
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Deutsch A.	Shock Metamorphism & Terres. Craters, Mon. p.m., Rm. 206	Fisenko A. V.	Cosmic Rays, Thurs. a.m., Rm. 206
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Dorfofeyeva V. A.	Planetary Accretion, Fri. a.m., Gym	Forni O.	Venus Geology, Thurs. a.m., Rm. 104
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Duane M. J.	Shock Metamorphism & Terres. Craters, Mon. p.m., Rm. 206	Fukunaga K.	Mars: Remote Sensing/Volcanism, Mon. p.m., G104
Duren H.	Cosmic Dust I, Mon. a.m., Rm. 206	Futrell D. S.	Carbonaceous Chondrites, Mon. p.m., Gym
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Koonz S.  
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 See T. H.  
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 Tonks W. B.  
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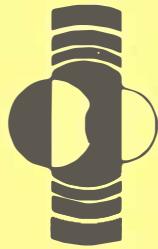
Ward W. R.  
 Warren P. H.  
 Warren P. H.  
 Wasson J. T.  
 Watts A.  
 Weinbruch S.  
 Weisberg M. K.  
 Wentworth S. J.  
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