LUNAR AND PLANETARY

USRA

INFORMATION BULLETIN

MAY 1989 • NUMBER 53

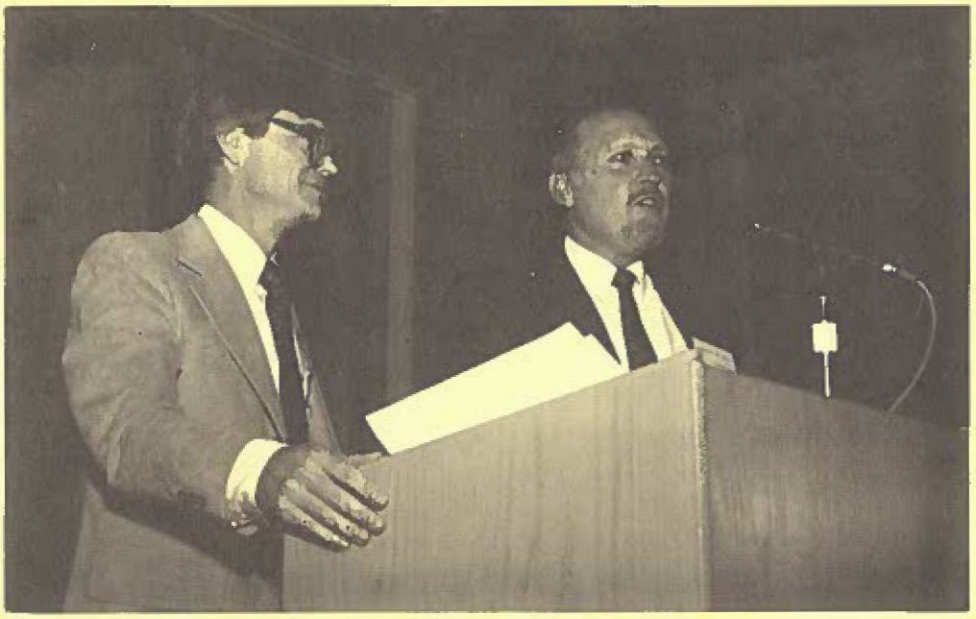
20th Lunar and Planetary Science Conference

A total of 729 scientists from 15 countries attended the 20th Lunar and Planetary Science Conference in Houston, March 13–17. Conference sponsors were the Lunar and Planetary Institute, NASA Johnson Space Center, American Association of Petroleum Geologists, American Geophysical Union, Division for Planetary Sciences of the American Astronomical Society, Geological Society of America, International Union of Geological Sciences, and Meteoritical Society.

The conference program was prepared on the basis of 678 submitted abstracts. Chairmen of the conference were David C. Black, Lunar and Planetary Institute, and Michael B. Duke, NASA Johnson Space Center. Topics included in the program were remote sensing, volcanism, and geology of Mars; ordinary chondrites, carbonaceous chondrites, and chondrules; cosmic dust; shock metamorphism and terrestrial craters; planetary differentiation; interstellar grains and dust; Bholghati and angrite consortia; lunar geology; geophysics and geology of Venus; cosmic rays; and asteroids. A public session entitled *Opportunities in Solar System Exploration* was held Tuesday evening at the JSC Building 2 Auditorium. A drawing was held at the end of the week to award three lucky attendees with a year's subscription to *Air & Space/Smithsonian* magazine. The winners were Nadine Barlow, Lunar and Planetary Institute; Fred Becker, Houston, Texas; and Randy Cassingham, Jet Propulsion Laboratory.

This year's conference was a special one, as it commemorated the 20th annual gathering since the first samples were returned from the Apollo missions. In celebration of this anniversary, there was a special session held on Wednesday afternoon to examine some of the major scientific aspects of lunar science. Invited speakers were George W. Wetherill, Carnegie Institution of Washington; Grenville Turner, University of Manchester; Graham Ryder, Lunar and Planetary Institute; Paul D. Spudis, U.S. Geological Survey; and Johannes Geiss, University of Bern. The focus of this retrospective was to determine what answers we have gained to questions that existed at the beginning of the Apollo program, to see what continuing or new questions remain as challenges for future generations, and to examine how results from the scientific study of the Moon relate to the broader area of planetary science.

Following this special session, an anniversary banquet at the new South Shore Harbour Conference Center provided both LPSC attendees and invited Apollo team guests a chance to meet and reminisce. The speaker was George



David C. Black and Michael B. Duke, Co-chairmen of the 20th LPSC

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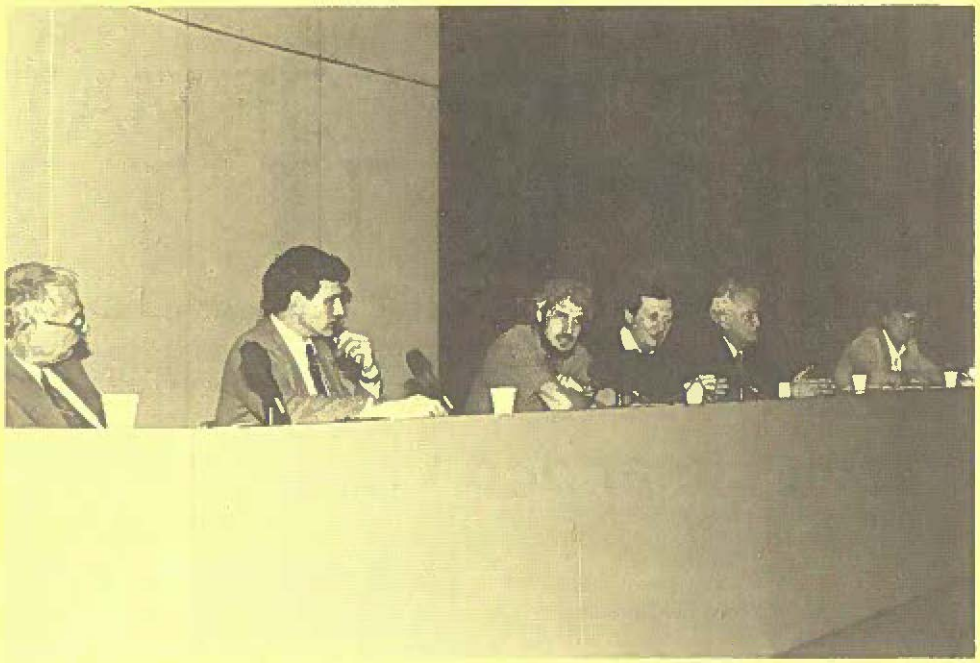
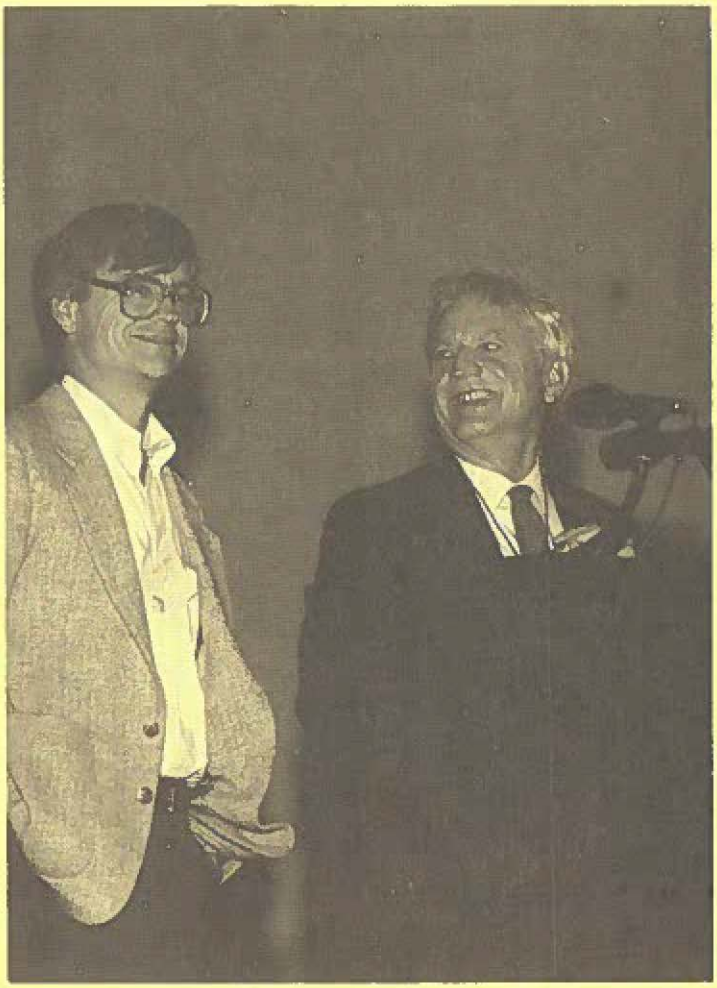
Mueller, who was the Associate Administrator for Manned Space Flight at NASA Headquarters during the Apollo era. Mueller's talk was preceded by remarks by Paul Coleman, President of the Universities Space Research Association, and James Head of Brown University. Aaron Cohen, on behalf of NASA, then presented David Black and Michael Duke with a special plaque commemorating the achievements of the scientists and engineers of the Apollo program that initiated 20 years of scientific discovery and enabled a new vision of the Moon. The concept for the plaque's design was created by Shirley Brune, a graphic artist at the LPI. The plaque will be placed in the new JSC Visitor's Center and a duplicate has been placed in the lobby of the LPI.

The 20 years of scientific study since the first samples were returned have yielded invaluable information about the Moon and, as a result, our entire solar system. We hope that the next 20 years will continue this legacy.

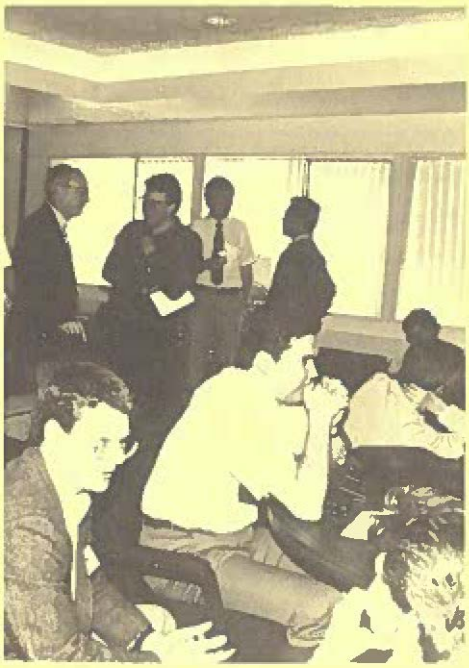


A special plenary session reviewed the scientific aspects of lunar science.

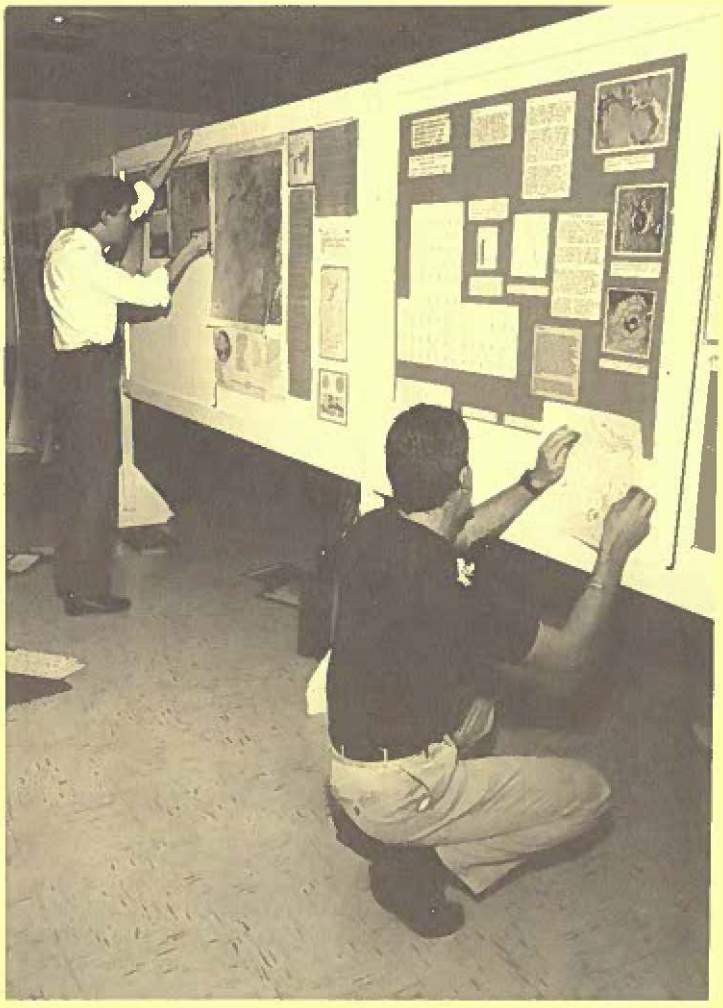
Paul Spudis addresses cratering history of the Moon.



Origin of the solar system issues get the attention of D. Black and G. Wetherill.



Twenty Years of Lunar Science: Sharing Answers and Questions . . .



. . . Preparing for the Future and Reviewing the Past

Publications

New Publications from GPO

Several publications pertinent to space science have recently been published by the U.S. Government Printing Office. They may be obtained from the GPO Bookstores (located in several major cities across the United States; check your phone book for local listings). They may also be ordered from the Superintendent of Documents, Washington, DC 20402-9325 by sending prepayment or charging to Visa or Mastercard.

Sapping Features of the Colorado Plateau

116 pp., 1988. Order No. S/N 035-000-01027-3 $6.00

This volume presents papers that examine the role of groundwater sapping in producing valley networks on Mars and in analogous terrestrial environments. The studies incorporate a variety of methods, including interpretation of Mars images, field investigations of terrestrial valley systems originating from groundwater sapping, experimental development of sapping valleys, and theoretical models of sapping processes.

Spinoff 1988

148 pp., 1988. Order No. S/N 033-000-01031-1 $9.00

This publication is intended to heighten awareness among potential users of the technology available for transfer and the economic and social benefit that might be realized by secondary applications. SPINOFF 1988 is organized in three sections: Section 1 outlines NASA's mainline effort, the major programs that generate new technology and therefore replenish and expand the bank of knowledge available for transfer. Section 2, the main feature of this volume, contains a representative sampling of spinoff products that resulted from secondary application of technology originally developed to meet mainline goals. Section 3 describes the various mechanisms NASA employs to stimulate technology transfer and lists, in an appendix, contact sources for further information about the Technology Utilization Program.

Space Shuttle — The Journey Continues

24 pp. (color illustrations), 1988. Order No. S/N 033-000-0102605 $4.00

This beautifully illustrated large-format booklet describes the rationale for the space shuttle project in particular and the U.S. space program in general. Besides outlining the history of shuttle flight, it also documents the work of other countries with man-in-space programs. This is an excellent publication for the nominal cost.

New Materials from Astronomical Society of the Pacific

The A.S.P. is an international scientific and educational organization founded in 1889 that serves as a bridge between astronomers and the public. They have produced a number of publications in various media. Any of their products can be ordered from A.S.P., 390 Ashton Avenue, San Francisco, CA 94112. California residents please add sales tax to prices.

Teachers Take Note

The publishers of *Astronomy* magazine have launched a new monthly supplement to support and strengthen the growing interest in astronomy and space science education. Entitled *Astronomy Educator*, the magazine will be published nine times a year and will be distributed with *Astronomy*. It will feature latest world news about astronomy education and educators; a lesson plan complete with teacher's guide and classroom activities; and information about new resources in the field. Current subscribers to *Astronomy* can pay only $1.00 per issue additional to receive *Astronomy Educator* for the term of their subscription. For new subscribers the cost of *Astronomy* and *Astronomy Educator* is $29.95. Foreign subscription price is $38.95. Send subscription requests to Kalmbach Publishing Co., 1027 N. Seventh St., Milwaukee, WI 53233-9972. Questions? Call 414-272-2060.

Heavens on Tape

Two cassette tapes, booklets and maps. $19.95. Request Tape NOA1

"Tapes of the Night Sky" features guided tours of the heavens for each of the four seasons. Each half-hour tour features basic, easy-to-follow instructions, together with interesting information about the astronomy and mythology of the objects to be identified. By relying on the brightest stars as guideposts, stargazers of all ages can get to know the sky quickly and enjoyably. The tapes are accompanied by a booklet with the full script, four specially designed star maps, and a beginning observer's reading list.

Videotape of Voyager Uranus Discoveries

VHS format videotape, booklet; $34.95. Request Uranus tape

A videotape showing the many discoveries about the planet Uranus, its satellites, and its ring system during the Voyager flyby in 1986 has been produced by NASA and narrated by planetary scientist Dr. Albert Hibbs. The 30-minute tape includes some excellent animation, great images, and fine analogies for explaining what the mission revealed. Several mission leaders are interviewed about our improved understanding of the giant planet that "orbits on its side," the many thin dark rings that girdle the planet, and the wide variety of moons that accompany it. As a bonus, the tape includes two versions of "Miranda: The Movie," the fascinating computer-animated tour of the Uranus satellite that has some of the most bizarre and puzzling terrain in the solar system. The booklet includes a good nontechnical reading list about Uranus.

Astronomy Audiotapes

A new series of audiotapes on astronomical topics is available. The tapes, designed for listeners without significant science background, include: "Discovery of Pulsars" – features interviews with the discoverers; excerpts from "Coming of Age in the Milky Way" (read by author Timothy Ferris) – describes the history of

astronomical discovery; "Brief History of Time" – presents the full text of the best selling book by Stephen Hawking; introduces black holes and the big bang.

To receive the Society's catalog of audiotapes and other astronomy materials, send two first-class stamps to the A.S.P. Audio Catalog Department.

Keeping Up With Mars

Univelt Incorporated, publisher of the American Astronautical Society publications, has three Mars conference proceedings in its current list.

"Case for Mars I" v.57, Science and Technology Series (1984, 348 pp., hard cover $45; soft cover $25); "Case for Mars II" v.62, Science and Technology Series (1988, 730 pp., hard cover $60; soft cover $40).

These volumes provide a blueprint for manned missions to Mars and a continued presence on the planet's surface, including what technology is required and what kinds of precursor missions and experiments are required for this undertaking. Volume 57 is based on the first Case for Mars conference held April 29 – May 2, 1981. Volume 62 is based on the second conference held July 10–14, 1984.

"NASA Mars Conference" v.71, Science and Technology Series (1988, 554 pp., hard cover $50; soft cover $30).

This volume covers (1) our current knowledge and understanding of Mars: history, geology, volcanism, channels, moons, atmosphere, meteorology, water and other volatiles, biological and life questions; (2) present and future unmanned exploration: 1988–1989 Soviet Phobos mission, Mars observer, Mars aeronomy, seismic network, Mars sample return and Mars rover concept; (3) engineering issues and options for manned exploration: pathways, scenarios, transportation; and (4) human dimensions: human factors, life support, living, and working on Mars.

Order from Univelt Inc., P.O. Box 28130, San Diego, CA 92128. Mention that you saw it in the LPIB and receive a 25% discount off the list price. Postage and handling charges are $4.00 for the first book and $1.00 for each additional book.

Meetings

Vienna Site for Three Workshops, Summer 1989

Vienna, Austria, is the site for three workshops this July. Since most participants are expected to attend the 52nd Annual Meeting of the Meteoritical Society, the two small workshops were scheduled to precede the major meeting. Details on each meeting follow. Anyone desiring additional information about these workshops should contact the Projects Office, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058-4399 or phone 713-486-2150.

Workshop on Cosmogenic Nuclide Production Rates

Cosmogenic nuclide production rates have been the subject of a considerable research effort over the past few decades. A workshop on this topic will be held at the University of Vienna July 25–26, 1989, sponsored by the Lunar and Planetary Institute, the San Jose State University, and the University of Vienna. The workshop should help to clarify such issues as (1) which production rates are considered to be sufficiently well studied, (2) which chemistry and shielding correction methods are satisfactory, (3) where improvements have to be made, and (4) how to proceed in order to solve identified problems.

Most of the workshop session time will be dedicated to general and panel discussions, although there are a number of invited talks planned. Limited space will be available for poster presentations.

Workshop on Differences Between Antarctic and Non-Antarctic Meteorites

July 27–28, 1989, are the dates of a workshop designed to evaluate the facts and discuss new evidence concerning the differences between Antarctic and non-Antarctic meteorites. The meeting is sponsored by the Lunar and Planetary Institute and the University of Vienna. The workshop is structured around a number of short invited talks that either help define a problem or report new results, with the majority of time allocated to panel and general discussions. In addition, limited space is available for poster presentations.

52nd Annual Meeting of the Meteoritical Society

The 52nd Annual Meeting of the Meteoritical Society will be Monday, July 31 through Friday, August 4, 1989, at the University of Vienna in Vienna, Austria. As usual the conveners have planned an exciting meeting of scientific sessions with many social events and cultural activities also on the agenda. This year's meeting is sponsored by University of Vienna; Naturhistorisches Museum, Vienna; Lunar and Planetary Institute, Houston; and Ministry of Science and Research, Vienna.

The scientific sessions will deal with all aspects of meteorite, lunar, planetary, and related research. There are also plenary lectures to commemorate the 20th anniversary of the first manned mission to the Moon and 20 years since the fall of the Allende meteorite. Also planned are two five-day field trips: one trip to the Austrian Alps with visits to Salzburg and Innsbruck and another trip to Lower Austria and Czechoslovakia.

MEVTV Workshop on Tharsis

A workshop on the origin and evolution of the Tharsis region of Mars will be held at Estes Park, Colorado, October 4–6, 1989. This workshop is sponsored by LPI as part of the Mars Evolution of Volcanism, Tectonics and Volatiles (MEVTV) Project. Because the format of the workshop will stress informal discussion and debate, it may be necessary to limit attendance. For additional information, contact the conveners: R. J. Phillips (214-692-3196) or K. Tanaka (602-527-7208) or the Projects Office at the Lunar and Planetary Institute (713-486-2150).

Workshop on Lunar Volcanic Glasses

A workshop will be convened at the Lunar and Planetary Institute on October 10–12, 1989, on Lunar Volcanic Glasses: Scientific and Resource Potential. The most recent NASA sponsored workshop dedicated to the topic of lunar mare volcanism was held 14 years ago, and since then lunar volcanic glasses have increasingly been recognized as the best geochemical and petrologic probe into the lunar mantle. This workshop is LPI/LAPST sponsored. More information is available from conveners J. Delano (518-442-4479) or G. Heiken (505-667-8477) or from the Projects Office, at the Lunar and Planetary Institute (713-486-2158).

LPI Intern Program: Summer 1989

The 1989 LPI summer intern program will offer eight undergraduate students an opportunity to participate in research with scientists at the LPI and at the NASA Johnson Space Center. Each student performs project and research assignments under the direction of a scientist/advisor during the 10 weeks of internship. Throughout the summer program frequent lectures and seminars by scientists in a variety of space science programs offer additional exposure to many areas of planetary science studies. The mini-conference at the end of the summer allows each intern to prepare a technical manuscript and present the results of his/her research program in a lecture format.

There were 95 applicants to this year's program. The LPI scientific organizers are Dr. Nadine Barlow and Dr. Bruce Bills.

The 1989 interns, their projects, and advisors are as follows:

JAMES SAMUEL BALAFAS, University of Denver
PROJECT: Measure hydrogen abundances in lunar cores. The study will assist with the determination of hydrogen in lunar soils as a function of depth and distribution within a particular landing site sampled by the Apollo astronauts. Hydrogen will be extracted from the soils by heating with a resistant or solar furnace and the released hydrogen will be measured with a gas chromatograph.
ADVISOR: Dr. Everett Gibson, NASA Johnson Space Center.

ROBERT A. BRACKETT, University of Texas at Austin
PROJECT: Analyze gravity data over the Manson Structure, Iowa, in conjunction with shallow well log information, to constrain three-dimensional models of the substructure. In testing models, both impact models and "cryptovolcanic" models will be considered.
ADVISOR: Dr. Virgil A. Sharpton, Lunar and Planetary Institute.

MARK A. FISCHER, Princeton University
PROJECT: Test a number of specific models of the structure and tectonics of the equatorial highlands of Venus. The LPI Geophysical Data Facility provides both easy access to the topography and gravity data acquired by the Pioneer Venus Orbiter spacecraft and the computational tools required to check the gravitational implications of proposed models against the observations.
ADVISOR: Dr. Bruce Bills, Lunar and Planetary Institute.

ERIC B. GROSFILS, The College of William and Mary
PROJECT: Continue a study to determine the effects of different surface properties on martian crater ejecta morphology. Included in the analysis will be consideration of the possible origins of the surface layers and their potential influences on resulting morphology.
ADVISOR: Dr. Nadine Barlow, Lunar and Planetary Institute.

ELIZABETH J. LINSTROM, University of Wisconsin-Madison
PROJECT: Characterize micrometeorite and meteoritic ablation spheres (impact debris?) found within 130-m.y.-old algal stromatolite from the middle/upper Jurassic boundary, S. Poland. Also involved will be hands-on training in the INAA, Probe, and SEM techniques and data reduction and interpretation.
ADVISORS: Dr. A. V. Murali, Lunar and Planetary Institute, and Dr. Michael Zolensky, NASA Johnson Space Center.

SCOTT RAY MONCRIEF, University of Hawaii
PROJECT: Study photogeological interpretation of the surface of Mars. Using automated image storage and retrieval techniques, the intern will search Viking orbiter images with resolutions in the 20-25 m/pxl range and catalog all salient geological features: location, craters, dunes, streaks, ridges, etc.
ADVISOR: Dr. Steven H. Williams, Lunar and Planetary Institute.

CASSI R. PASLICK, University of Michigan
PROJECT: Study the origin of basaltic meteorites (eucrites). Test models of eucrite formation by experimentally determining the partition coefficient of Sc (ScD) for olivine and pyroxene grown from eucrite-composition liquids. These experiments will allow scientists to evaluate whether olivine fractionation alone is capable of producing the Sc depletion observed in eucrites or whether additional pyroxene fractionation is required.
ADVISORS: Dr. John Jones and Dr. Gordon A. McKay, both of NASA Johnson Space Center.

KRAIG E. SHEETZ, Millersville University
PROJECT: Catalog data on ocean phenomena. Data obtained by examining ocean scene photographs taken by space shuttle astronauts will be entered into a computer database and plotted on a series of season maps. This information will be used to test theories concerning the origin of large, dynamic ocean features.
ADVISORS: Dr. Charles Wood and Dr. Kathryn Sullivan, both of NASA Johnson Space Center.

SPACEWEEK '89

Commemoration of the 20th anniversary of man's first Moon landing will be featured as part of Spaceweek, an annual national celebration of space, July 16-24. Hundreds of events will salute the theme "From Apollo to the Stars: Join the Journey" by looking at both past and present space achievements and future plans for exploring and developing the space frontier, according to Spaceweek organizer Dennis Stone. Dr. Christopher C. Kraft, Jr., has been named National Chairman of the 20th Apollo anniversary.

Appearances by the Apollo 11 crew will highlight Spaceweek. Neil Armstrong, Edwin "Buzz" Aldrin, and Michael Collins will attend public festivities in Huntsville, Alabama; Houston, Texas; Kennedy Space Center, Florida; and Washington, D.C. "Although Spaceweek falls during the anniversary of Apollo 11, it is a celebration of the entire space program," Stone said. "The events educate the public about future plans for lunar and Mars development and space science research with rich potential benefits for Earth."

Festivities taking place in Houston include the Apollo 20th Anniversary Gala cosponsored by NASA Johnson Space Center, the American Institute of Aeronautics and Astronautics, and Spaceweek, Inc. The gala is scheduled for Friday night, July 21, at the Hyatt Regency Downtown in Houston. Other Houston events planned include a public space festival, JSC open house, and an Apollo reunion.

To help commemorate Spaceweek '89 and the 20th anniversary of Apollo, an open house will also be held at the LPI on July 21 from 10:00 a.m. to 5:30 p.m. The open house will provide the public with an opportunity to view the mansion and learn more about the role of the LPI. The open house will include a tour of the grounds and the first floor of the main building, an image processing demonstration by the Computer Center, and a slide presentation by USRA, the LPI's parent organization.

AVAILABLE FROM LPI

— BOOKS —

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

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

Hardcover, 800 pp., 187 figures, glossary, subject and author indexes **Order Code: B-ORIGIN, $25.00**

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

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

Softcover, 865 pp., 211 figures and illustrations, indexes, references **Order Code: B-BASES, $20.00**

PLANETARY SCIENCE: A LUNAR PERSPECTIVE—S. Ross Taylor

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

Hardcover, 481 pp., 176 illustrations, glossary, index **Order Code: B-PLANS, $30.00**

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

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

Hardcover, 375 pp., 129 figures and tables, subject index **Order Code: B-CHON, $25.00**

— SLIDE SETS —

Each set includes an explanatory booklet.

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

Order Code: S-STONES, $15.00

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

Order Code: S-VOLCA, $12.00

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

Order Code: S-APOLLO, $17.00

(Over, please)

SLIDE SETS—*continued*

SHUTTLE VIEWS THE EARTH: THE OCEANS FROM SPACE This slide set offers a selection of the most fascinating and informative Shuttle photographs of the oceans and features images taken with a variety of equipment. Naturally occurring sea surface features have been photographically recorded, as well as the meteorological and oceanic influences on land masses. (40 slides) **Order Code: S-OCEAN, $17.00**

SHUTTLE VIEWS THE EARTH: CLOUDS FROM SPACE This slide collection includes some of the most informative and visually impressive cloud photographs taken in twenty-four Shuttle missions. The accompanying booklet has a foreword by astronaut Robert Crippen. The unique perspective of Shuttle photography helps us to understand weather patterns and the development of weather systems worldwide. (40 slides) **Order Code: S-CLOUD, $17.00**

SHUTTLE VIEWS THE EARTH: GEOLOGY FROM SPACE Photographs of stunning geological features on the Earth have captured the attention of Shuttle astronauts mission after mission. Shuttle photographs enable us to trace fault margins in the Earth's crust and observe large structures, such as meteor impact craters, in their entirety and in the context of their surroundings. The images reveal how much of the Earth's surface is covered by vast deserts and also provide comparisons of old volcanic structures with young erupting volcanoes at various locations around the world. (40 slides)
Order Code: S-GEOL, $17.00

— TECHNICAL REPORTS AND CONTRIBUTIONS —

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

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

Order Code: R-86-02 WORKSHOP ON PAST AND PRESENT SOLAR RADIATION: THE RECORD IN METEORITIC AND LUNAR REGOLITH MATERIAL. R. Pepin, D. S. McKay

Order Code: R-86-04 WORKSHOP ON EARLY CRUSTAL GENESIS: THE WORLD'S OLDEST ROCKS. L. D. Ashwal

Order Code: R-86-05 TRAJECTORY DETERMINATIONS AND COLLECTION OF MICROMETEOROIDS ON THE SPACE STATION. F. Horz

Order Code: R-86-06 WORKSHOP ON COSMOGENIC NUCLIDES. R. C. Reedy, P. Englert

Order Code: R-86-09 MECA WORKSHOP ON DUST ON MARS II. S. Lee

Order Code: R-87-01 MECA SYMPOSIUM ON MARS: EVOLUTION OF ITS CLIMATE AND ATMOSPHERE. V. Baker, M. Carr, F. Fanale, R. Greeley, R. Haberle, C. Leovy, T. Maxwell

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

Order Code: R-88-01 PROGRESS TOWARD A COSMIC DUST COLLECTION FACILITY ON SPACE STATION. I. D. R. Mackinnon, W. C. Carey

Order Code: R-88-02 WORKSHOP ON THE GROWTH OF CONTINENTAL CRUST. L. D. Ashwal

★Price: $6.00★Order Code: R-88-03 ASTRONAUT'S GUIDE TO TERRESTRIAL IMPACT CRATERS. R. A. F. Grieve, C. A. Wood, J. B. Garvin, G. McLaughlin, J. F. McHone, Jr.

Order Code: R-88-05 MEVTV WORKSHOP ON NATURE AND COMPOSITION OF SURFACE UNITS ON MARS. J. R. Zimbelman, S. C. Solomon, V. L. Sharpton

Order Code: R-88-06 WORKSHOP ON THE DEEP CONTINENTAL CRUST OF SOUTH INDIA. L. D. Ashwal

Order Code: R-88-07 WORKSHOP ON MARS SAMPLE RETURN SCIENCE. M. Drake, R. Greeley, G. McKay, D. Blanchard, M. Carr, J. Gooding, C. McKay, P. Spudis, S. Squyres

Order Code: R-88-08 A COMPILATION OF INFORMATION AND DATA ON THE MANSON IMPACT STRUCTURE. J. Hartung, R. Anderson

Order Code: R-88-09 SCIENTIFIC RESULTS OF THE NASA-SPONSORED STUDY PROJECT ON MARS: EVOLUTION OF ITS CLIMATE AND ATMOSPHERE. S. Clifford, R. Greeley, R. Haberle

Order Code: R-88-10 MECA WORKSHOP ON ATMOSPHERIC H_2O OBSERVATIONS OF EARTH AND MARS. S. Clifford, R. Haberle

Order Code: C-652 SYMPOSIUM ON LUNAR BASES & SPACE ACTIVITIES OF THE 21st CENTURY. April 5-7, 1988 (abstracts)

Order Code: R-89-01 MECA WORKSHOP ON DUST ON MARS III, S. Lee

Order Code: R-89-02 ANTARCTIC METEORITE LOCATION AND MAPPING PROJECT. J. Schutt, B. Fessler, W. Cassidy

— LPSC ABSTRACTS —

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Special Observances Mark 100th Anniversary of Astronomical Society of the Pacific

An asteroid has been named *ASP* in honor of the Astronomical Society of the Pacific on the 100th anniversary of its founding. The announcement of asteroid ASP begins a year of centennial celebrations, including a major conference at the University of California at Berkeley scheduled for June 21–25.

Asteroid ASP is a small rocky object orbiting between Mars and Jupiter. It was discovered on November 8, 1959, as part of a major asteroid search program at the Goethe Link Observatory of Indiana University. It was the 2848th asteroid to be discovered in our solar system.

The Astronomical Society of the Pacific is one of the largest astronomical organizations in the world, with members in all 50 states and over 70 other countries. In addition to holding meetings and workshops and supporting its programs, the organization publishes two scientific journals (*Publications of the A.S.P.* and *Mercury* magazine) and *The Universe in the Classroom*, its newsletter for teachers, as well as conference proceedings volumes and audio-visual materials for teaching and learning astronomy.

The Centennial Meeting will offer three scientific symposia on the evolution of the cosmos and a weekend of nontechnical lectures and seminars on astronomical topics. Dr. Carl Sagan of Cornell University will give a major public lecture on Sunday, June 25, on the Berkeley campus.

For more information on the conference, contact: Berkeley Meeting, A.S.P., 390 Ashton Ave., San Francisco, CA 94112.

Correction to *Ad Astra* Information

The last issue of LPIB included an article about the new magazine *Ad Astra*, available from the National Space Society. This article erroneously listed a special subscription rate of $20 for educators. Please note that there is no educator's rate. Contact the National Space Society for other subscription details.

Telecommunications

New Software Support Function

Jackie Lyon has recently been appointed to head the software support office in the Computer Center at LPI. Part of her new duties will be to help with telecommunications and networking questions from scientists both within the LPI and throughout the scientific community at large.

The LPI has compiled several pamphlets for those using computer networks to communicate with others. To receive any of these pamphlets, contact Jackie at 713-486-2192, LPI::LYON on the SPAN network, or [LPI,NASA]NASAMAIL/USA from any Telemail system.

LPI Computer Access

This short pamphlet gives step-by-step instructions for connecting to the LPI VAX computer. Instructions are given for access by Direct Dial and from the NASA SPAN network, NPSS (NASA Packet Switching System), and Internet networks. Users may access databases in the new Integrated Data System, which consists of the Geophysical Data Facility, Lunar and Planetary Bibliography, Image Retrieval and Processing System, and Planetary Cartography System. Telemail Systems accounts at the LPI are also listed.

Directory of Electronic Mail Addresses

The LPI began collecting electronic mail addresses in March 1987. Addresses come from interest forms submitted for the LPSC and in response to a questionnaire in an earlier issue of the Bulletin. A recent update was done to incorporate changes submitted by the 20th LPSC attendees. A new issue of this directory with corrections and additions received during the conference will be available upon request by June.

Network Interconnections

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

LPI Telecommunications Numbers

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

LPI Telex Number: 7400832
Answerback: LAPI UC

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

Proceedings of the Nineteenth Lunar and Planetary Science Conference

Deadline for submission to the 20th Proceedings *is May 26, 1989.*

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 is intended to incorporate, but is not limited to, material from the Nineteenth Lunar and Planetary Science Conference held at the NASA Johnson Space Center in Houston, March 1988.

The *19th Proceedings* comprises 66 papers on topics ranging 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 on impact events on the Earth. There are also papers on the geology and petrology of the Moon and other planets; meteorites; comets; cosmic dust, solar system geochemistry; and a large section on impact cratering studies.

The *Proceedings* 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 the Lunar and Planetary Institute/G. Ryder and V. L. Sharpton
ISBN 0-521-37409-X 784 pp. 8½ × 11"
Publication date: March 1989.
List price: $100.00.
For order form, please see page 11.

Also available:

Proceedings of the Eighteenth Lunar and Planetary Science Conference

Edited by the Lunar and Planetary Institute/G. Ryder
ISBN 0-521-35090-5 753 pp. 8½ × 11"
Publication date: March 1988.
List price: $65.00.
For order form, please see page 11.

Change of Publisher

Please Note: Cambridge University Press is the sole distributor of the *18th* and *19th Proceedings*. They are no longer available as a supplement to the *Journal of Geophysical Research* or as part of a journal subscription, and they are published as hardbound books only. Libraries, institutions, and individuals are encouraged to place an order for these books now to insure the continuity of the series in their collections, and to establish a standing order plan for future *Proceedings*.

Important Publication Deadlines

The deadline for abstracts for the Twenty-first Lunar and Planetary Science Conference is **January 17, 1990.** Please mail early. We have no control over postal strikes, winter storms, or federal holidays between Christmas and January 17. Any abstract received after 6:00 p.m. on the deadline will be returned to the author.

Deadline for submission to the *Proceedings of the 20th Lunar and Planetary Science Conference* is **May 26, 1989.** For information on submitting to the *Proceedings* (or *LPSC XXI*), contact Renee Dotson, Senior Technical Editor, Lunar and Planetary Institute, at 713-486-2188 or by electronic mail via NASA/SPAN at LPI::DOTSON.

The LUNAR AND PLANETARY INFORMATION BULLETIN is published three times a year by the Lunar and Planetary Institute, 3303 NASA Road 1, Houston, Texas 77058-4399.

Fran Waranius, *Editor.*

Editorial and production support were provided by the Publications Services Department at the LPI.

Copy deadline for the September issue of the *Bulletin* is August 1, 1989. Send information or announcements to be included to the LPI Publications Office, 3303 NASA Road 1, Houston, TX 77058-4399.

Continued Growth for ISU

The International Space University (ISU) has announced developments in its faculty and student body for the summer session in France. Five Soviet faculty members including Cosmonaut Oleg Atkov and at least 12 Soviet graduate-level students will participate in the ISU's 1989 summer session. In addition, six participants and one faculty member will be sent from the People's Republic of China. In the U.S., up to 24 students may participate including, for the first time, young professionals from NASA.

ISU'89 will be held from June 30 to August 31 at the Universite Louis Pasteur in Strasbourg, France, and is expected to have a student body from over 20 countries. Subsequent summer sessions will take place in leading academic institutions around the world until 1992 International Space Year, when ISU plans to establish its permanent campus and offer a year-round Master's program in space studies. ISU has been designated to become the worldwide center for educating space professionals. A total of 21 nations participated in last year's program.

Finalists and Faculty Selected for Summer Session

The Admissions Committee of the ISU selected over 100 graduate-level students and young space professionals as finalists to attend the 1989 summer session. While the Committee met at the Spring Curriculum Planning meeting, ISU also announced the appointment of two distinguished space leaders to head its faculty at the summer session. Dr. Gerhard Haerendel of the Max-Planck-Institut will act as the Dean of Faculty of ISU'89. Dr. Wendell W. Mendell of NASA was chosen to be the Associate Dean. Both Drs. Haerendel and Mendell are co-directing the Space Physical Sciences Department of ISU'89. The ISU faculty is drawn from both the private and public sector.

ISU Expands International Impact

The International Astronautical Federation (IAF) unanimously decided to accord membership to ISU at their 39th Congress in Bangalore, India. In addition, ISU became the first educational project to be recognized by the IAF International Space Year Committee. Designated for 1992 the International Space Year will correspond to the launch of the year-round graduate program planned by the International Space University.

Moving toward their goal of establishing permanent campus locations around the globe, ISU visited several locations offered by Sri Lanka.

"This and other locations offered by the Sri Lankan government, coupled with indications from Japan, the United States and the Soviet Union, bring the concept of permanent global facilities that much closer to reality," said Todd Hawley, ISU administrator. The concept of multiple campuses, each site specializing on one aspect of the ISU curriculum, is intended to enhance international collaboration in space-related projects.

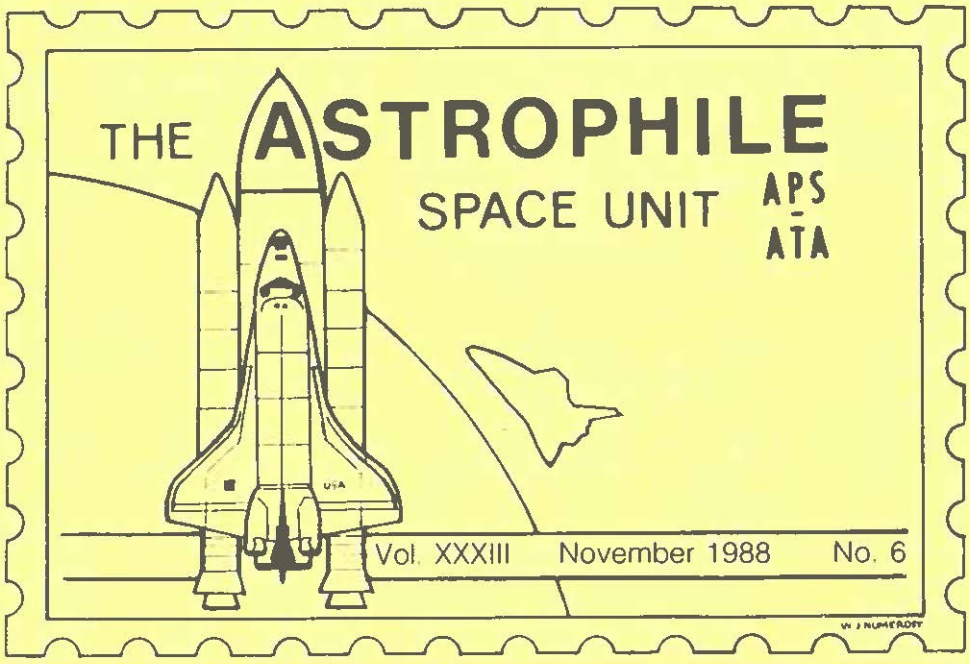
Magellan Launched on Its Way to Venus

A new era in planetary science began on Thursday, May 4, 1989, with the successful launch of the Magellan space probe from the Space Shuttle Atlantis. Mark Lee, Mission Specialist, reported that the deployment went very smoothly.

Following insertion into Venus orbit in August 1990, approximately 18 days will be spent checking out the spacecraft and its imaging radar. The prime mapping mission then will begin, lasting 243 Earth days or 1 Venus day.

The imaging radar is capable of performing both surface imaging and altitude measurements. It is able to resolve surface features measuring from about 120 m near the equator to about 300 m near the north pole. The altimeter will measure elevations accurate to about 30 m.

Magellan will make 1852 mapping swaths around the planet during the primary mission.



Are You Aware of the Space Philatelic Group?

Collectors of space-related postage stamps, covers, and special event stamped envelopes may be interested in the Space Topic Study Unit and its bi-monthly publication *The Astrophile*. Founded in 1957 this is the world's largest space philatelic group and they are affiliated with the American Philatelic Society and the American Topical Association. Their membership includes astronauts, scientists, astronomers, and people connected with the space industry, as well as other collectors.

For additional information about the Space Topic Study Unit, including membership, contact:

Seymour Rodman,
P. O. Box 356, Chatham, NJ 07928.

Calendar

June

6–8 **Fourteenth Symposium on Antarctic Meteorites,** Tokyo, Japan. *Tokoa 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 1, 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 Comte, B-4200 LIEGE-OUGREE, Belgium.*

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.*

16–24 **Spaceweek,** Houston, Texas. *Dennis Stone, Spaceweek National Headquarters, P.O. Box 58172, Houston, TX 77259. Phone: 713-480-0007.*

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 EX4 4QE, United Kingdom.*

25–26 **Cosmogenic Nuclide Production Rates in Meteorites,** Vienna, Austria. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road 1, 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 1, 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 1, Houston, TX 77058-4399. Phone: 713-486-2150.*

October

1–3 **Lunar Commerce Conference: Building the Earth-Moon Bridge,** San Francisco, California. *Space Age Publishing Company, 20431 Stevens Creek Blvd., Cupertino, CA 95014. Phone: 408-996-9210.*

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.*

4–6 **MEVTV Workshop on "Tharsis,"** Estes Park, Colorado. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058-4399. Phone: 713-486-2150.*

9–11 **International Workshop on Physics and Mechanics of Cometary Materials,** Munster, Westphalia, FR Germany. *D. Stöffler and E. Spohn, Institut für Planetologie, Universität Münster, Wilhelm-Klemm-Str. 10, D-4400 Münster, FR Germany.*

10–12 **LPI-LAPST Workshop on Lunar Volcanic Glasses: Scientific and Resource Potential,** Houston, Texas. *Pam Jones, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058-4399. Phone: 713-486-2150.*

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

1–3 **American Astronautical Society Annual National Conference**, Los Angeles, California. *Carolyn E. Brown, AAS, 6212 Old Keene Mill Court, Springfield, VA 22152. Phone: 703-866-0020.*

6–8 **Third Pacific Basin International Symposium on Advances in Space Science Technology and Its Applications (PISSTA)**, Los Angeles, California. *Carolyn E. Brown, American Astronautical Society, 6212 Old Keene Mill Court, Springfield, VA 22152. Phone: 703-866-0020.*

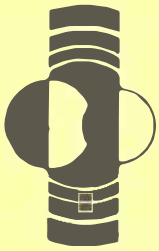
6–9 **Geological Society of America Annual Meeting**, St. Louis, Missouri. *Edna Collis, G.S.A., 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301. Phone: 303-447-2020 or 1-800-GSA-1988.*

December

4–8 **American Geophysical Union Fall Meeting**, San Francisco, California. *AGU Meetings, 2000 Florida Avenue NW, Washington, DC 20009. Phone: 202-462-6903.*

CORRECTION TO CALENDAR

Please note that the Seventh International Conference on Geochronology, Cosmochronology and Isotope Geology is scheduled for September 24–29, 1990, not 1989 as listed in the LPIB No. 52.



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