A Brief Encounter

Galileo at GASPRA

See article on page 8.
"Youth and Space: A Science Experience"

Girl Scouts on Mars!

Fifteen 8th-grade Girl Scouts of the South Texas Girl Scout Council spent a weekend at LPI to take part in "Youth and Space: A Science Experience," a workshop run by LPI staff and scientists. Through a variety of activities during the busy weekend, Scouts were introduced to issues and concepts in the exploration of other planets. Working in teams, they used their new knowledge to construct a model Mars base for presentation to the group and friends and relatives on Sunday.

The weekend began on Friday evening at Camp Wind-a-Mere in Dickinson, Texas, with a Sky Watch supported by members of the JSC Astronomical Society. Although the skies were mostly cloudy, Scouts got good views of the Moon and Saturn. Space artist Pat Rawlings provided a glimpse of things to come with a slide show of his many paintings and drawings.

On Saturday morning, LPI Director David Black welcomed the girls, who were soon off on a grand tour of the solar system in slides and pictures. LPI scientists devised interactive outdoor geology labs to demonstrate planetary processes such as cratering, volcanism, and erosion. Indoors, another group of LPI scientists helped Scouts use stereo viewers and globes to familiarize themselves with martian landforms.

After lunch at the JSC cafeteria, the group toured the Space Station mockup and the Curatorial Facility, which houses lunar sample and meteorite collections. Back at LPI, the Scouts were introduced to the problems of building in the space environment by Michele Caruthers of the Sasakawa International Center for Space Architecture, University of Houston, who used models and slides to illustrate her talk. Steve Clifford, LPI, gave an overview of some of the life sciences issues involved in moving off the Earth by comparing our planet with Mars.

Dinner was a pizza party featuring astronaut Drew Gaffney, who showed a film of the Space Life Sciences-I shuttle mission in June 1991 on which he was a Mission Specialist. He discussed some of the early results from this first mission dedicated to life sciences experiments. After dinner, the Scouts met in teams to begin design of their Mars bases. Some worked out their ideas with pencil and paper and others used Moonbase, a computer program that simulates building a lunar outpost. After a very full day, the girls returned to camp.

On a rainy, blustery Sunday morning, base construction began in earnest in the Institute's Hess Room. Paul Spudis of LPI reviewed some basic concepts and the teams went to work. Some four hours later, the building teams presented their models to the other groups and assembled parents and friends, describing the purpose of their base and how they dealt with energy needs, shielding requirements, food supply, and other crucial aspects of the design. Scouts and leaders were presented with a specially designed patch to commemorate their "science experience." Deborah Domingue, the LPI scientist who coordinated the weekend with other scientists and staff, said, "This workshop was a pilot project for the Institute, and we're thrilled with its success. It became a learning experience for everyone involved. The scientists got a chance to see their enthusiasm for science reflected in the interest and excitement the Scouts poured into the weekend's activities. We also got a gentle reminder from the girls on how important a tool imagination can be. This workshop and others like it are needed by today's young people. They are our hope for the future, and these types of workshops are important for building the leaders we will need for tomorrow."
Girl Scouts from the South Texas Council spent the weekend at LPI learning about planetary geology and extraterrestrial environments as they prepared to design and build a model Mars base. Above, processes that shape planetary surfaces were demonstrated in outdoor geology labs; samples of rock types were examined; and astronaut Drew Gaffney explains early results from the SLS-1 mission. Finally, teams of Scouts built and presented their model Mars bases (right).

PHOTOS: D. RUEB, LPI
NEW IN PRINT

These publications are available from the publisher listed or may be ordered through local bookstores.

A REVIEW
WHAT IS A SHOOTING STAR?
WHY DO STARS TWINKLE?
WHY DOES THE MOON CHANGE SHAPE?
WHY DO WE HAVE DIFFERENT SEASONS?
By Isaac Asimov
Ask Isaac Asimov Reference Series, About Space
Color illustrations and photographs. Hardcover, each $11.95

I think these books are very educational. Although meant for the 2nd- and 3rd-grade level, I learned a few things from them myself. For example, I did not know that the atmosphere bends light, or what relation the Moon had to lunar calendars. I wish I had read them as a 2nd or 3rd grader. These books also explain the facts well and are easy to understand. The drawings help to explain, too; for instance, one shows the Moon in different phases around the Earth. The photography is terrific. The books have color photos of outer space, the seasons, the Moon, etc. In the back of each book there is a list of more books to read and places to write for more information.

The description in these books also caught my attention. I could really get a mental image of what the book was saying. I also had some fun reading these books. They are easy-to-read, relaxing books as well as educational.

I think every public and school library should have this series, or at least some of these books. The hardbacks are very sturdy for the library, and each page is about the size of a piece of typewriter paper, so most of the pictures are big and colorful. I would like to read more of the series.

—Abigail Ryder

(Ms. Ryder is a 6th-grade student at P.H. Greene Elementary School in Webster, Texas.)

NEW FROM THE ASTRONOMICAL SOCIETY OF THE PACIFIC

NEW, EXPANDED CATALOG OF ASTRONOMY MATERIALS
A new and expanded catalog of educational materials on astronomy was recently published by the A.S.P. The 48-page, fully illustrated catalog includes slides and videos, software and laser disks, posters and charts, observing tools, books for all ages, and a variety of other aids for exploring the universe. New items include slides and videos from Magellan at Venus, a videodisk edition of the film 2001 with a wealth of scientific and philosophical background, an audiotape of American Indian star tales, and an astronomy activity book for the whole family. To order a catalog, send your name and address and three first-class stamps to A.S.P., Catalog Request Dept., 390 Ashton Avenue, San Francisco CA 94112.

MAGELLAN VENUS SLIDE SET
A set of 20 dramatic slides from the Magellan spacecraft’s radar survey of Venus is now available. The images—the most detailed views of our cloud-shrouded planetary neighbor ever obtained—include vast troughs and trenches, impact craters, lava flows, huge volcanoes, “pancake domes,” and arachnoid features—so called because they re-
semble enormous spiderwebs. A view of Magellan’s launch from the space shuttle and a diagram of the way its remarkable radar system maps Venus are included. The package includes a 24-page book of nontechnical captions and a reading list. $24.95 from A.S.P., Venus Slide Orders Dept., 390 Ashton Avenue, San Francisco CA 94112.

PLANET FLYBY VIDEO
A videotape showing dramatic computer-animated sequences made from images from spacecraft exploring the planets has just been released. The 35-minute VHS tape includes three Magellan spacecraft films of the surface of Venus; Mars: The Movie, a flyover of the red planet’s chasms, volcanoes, and cratered highlands; Galileo films of the Earth-Moon flyby; and Earth: The Movie, a supercomputer simulation of the climate and features of a rotating Earth. A booklet of background information and a bibliography of nontechnical books and articles about the planets is included. $33.95 from A.S.P., Planets Video Orders, 390 Ashton Avenue, San Francisco CA 94112.

NEW TECHNICAL REPORTS AND A SHORT COURSE FROM LGI

A SHORT COURSE
A short course, "Lunar Soil Mechanics and Foundation Engineering," will be given by Dr. David Carrier and Dr. Stewart Johnson in conjunction with the Space 92 Conference in Denver, Colorado, May 31, 1992. Sponsored by the LGI and Space 92, the course is expected to attract 25-40 engineers, scientists, and program managers interested in lunar surface activities. Tuition is $225.00 with group rates available. Contact LGI, P.O. Box 5056, Lakeland FL 33807-5056. Phone: 813-646-1842; FAX: 813-644-5920.

LIBRARY OF CONGRESS EXPANDS NATIONAL TRANSLATIONS CENTER
The National Translations Center (NTC) at the Library of Congress announced the enhancement of its service, which contributes to the international competitiveness of American science and industry. Last year more than half the world’s scientific literature appeared in languages other than English. Beginning with letters to 50,000 research centers in the U.S., NTC is asking for cooperation in sharing American translating resources. The center gathers current unpublished English translations of critical research from international technical journals, patents, and conference papers. NTC Director Karl Green said, "For wider distribution, the first magnetic tape of the electronic index including descriptions of more than 11,000 translations has been sent to federal agencies and private vendors such as OCLC, NTIS, and NASA. Furthermore, magnetic tapes of translation descriptions are free to qualifying organizations." Contact K. R. Green, NTC, Library of Congress, Washington DC 20541. Phone: 202-707-0100; FAX: 202-707-6147.
Conference Information

CONFERENCE PROGRAM ON LINE
The LPSC Program will be accessible electronically on or about February 7 via the NASA Science Internet (NSI) or by direct dial.
• On NSI/DECNET (SPAN), type SET HOST LPI.
• On NSl/Internet, type TELNET LPI.JSC.NASA.GOV or TELNET 192.101.147.11.
• To dial direct, call 713-244-2090 or 713-244-2091. These are new modem numbers and will connect to 2400, 1200, or 300 baud.
For all three methods of access, respond to USERNAME: LPI. No password is necessary. Choose LPSC Conference Program from the menu.
For the first time, the program also contains abstracts from those authors who chose to submit an abbreviated version of their regular abstract. About 230 were received and placed on line this year.
If you have difficulty in accessing the LPI computer, please contact:
Kinpong Leung at 713-486-2165; (LPI::LEUNG on NSI/DECNET or leung@lpiipf.jsc.nasa.gov on NSI/Internet); or Lorraine Willett at 713-486-2194; (LLFISHER on NASAMAIL).

REGISTRATION/LPI OPEN HOUSE
The 23rd Lunar and Planetary Science Conference will open with a Registration/Open House on Sunday, March 15 from 6:00 to 9:30 p.m. at the new Lunar and Planetary Institute, 3600 Bay Area Boulevard. Registration will continue in the Gilruth Center, JSC, Monday through Thursday between 8:00 a.m. and 5:00 p.m. A shuttle bus will be available to transport participants between the LPI and local hotels Sunday evening from 5:45 p.m. to 10:00 p.m.

SHUTTLE BUS SERVICE
A shuttle bus service between JSC, LPI, and the various hotels will operate daily from 7:30 a.m. until 9:30 a.m., 11:00 a.m. until 2:00 p.m., and from 5:00 p.m. until 6:30 p.m. Buses will also operate 1/2 hour before and after each official evening function.
During the period of the conference, your conference badge will allow access to the Space Center at all gates, Building 2, the first floor of Building 1, and the Gilruth Center. Please be reminded that this badge does not allow access to those areas or buildings not open to the general public except to those specifically outlined above.
Arrangements may be made in the lobby of Building 2 for a guided tour of the Mission Control Center. For tour information, call 483-4321.

GUIDE TO SESSIONS
Monday Morning, 8:30 a.m.
• Magellan at Venus: The Global Perspective Emerges
• Meteorite Parent Bodies
• Mare Basalts, KREEP, and Copernican Ejecta

Monday Afternoon, 1:30 p.m.
• Venus Geophysics
• Assorted Achondrites
• Origin and Evolution of Planetary Systems

Monday Evening, 8:00 p.m.

Tuesday Morning, 8:30 a.m.
• Venus: Tectonism and Volcanic Associations
• Reduced Meteorites
• Evolution of the Lunar Crust and Mantle
• Outer Solar Systems/Remote Sensing: Laboratory

Tuesday Afternoon, 2:30 p.m.
• Venus Volcanism
• Chondrules
• Impact Cratering: Theory and Experimentation

Tuesday Evening, 7:00-9:00
• Poster Session I, Lunar and Planetary Institute

Wednesday Morning, 8:30 a.m.
• Tectonism and Volcanism: Moon and Mars
• Education: Outreach Opportunities
• Antarctic Micrometeorites and LDEF
• Solar Wind and Cosmic Ray Irradiation

Wednesday Afternoon, 2:30 p.m.
• Tectonism and Volcanism: Moon and Mars

Wednesday Evening, 7:00-10:00 p.m.
• Annual Barbeque Dinner, Landolt Pavilion

Thursday Morning, 8:30 a.m.
• Mars Surface and Atmosphere Through Time: Surface Properties and Processes
• Cosmic Dust and Comets
• Planetary Geochemistry

Thursday Afternoon, 1:30 p.m.
• Mars Surface and Atmosphere Through Time: Atmosphere and Surface-Atmosphere Interactions
• Stardust
• Terrestrial Impacts and the K/T Boundary

Thursday Evening, 7:00-9:00 p.m.
• Poster Session II, Lunar and Planetary Institute

Friday Morning, 8:30 a.m.
• Offerings from the Moon
• "Acapulcoites" and Stony-Iron Meteorites: Meteorite Organics
• Galileo Gaspra/Asteroids
**Meetings and Special Events**

**As the Conference takes shape in late January, we take the opportunity to list some of the meetings and special events planned for the 23rd LPSC. Some of the details may change and new activities may be added between Bulletin press time and the Conference.**

**POSTER SESSIONS**
Poster Sessions I and II will be held on Tuesday and Thursday evenings from 7:00 to 9:00 p.m. in the Great Room of the new LPI building. Poster authors will be on hand to discuss their presentations with other attendees and complimentary keg beer and soft drinks will be served during these sessions.

**DISPLAYS, DEMOS, AND EXHIBITS**
The on-line and remote access capabilities of the interrelated database systems in use at LPI will be displayed throughout the week at the new LPI facility at 3600 Bay Area Boulevard. Shuttle buses will transport attendees to and from the Gilruth Center. Travel time is about 10 minutes. The databases include the Geo-physical Data Facility (GDF) 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 LPI’s Computing Center for Planetary Data Analysis (CPDA) will demonstrate the image processing and scientific visualization capabilities of its Stardent Titan graphics supercomputer.

The Combined Publishers Exhibit will be on display at the LPI throughout the week.

Session Chairmen’s Breakfast meetings will be held in the Club Room, Gilruth Center, 7:45-8:15 a.m., Monday through Friday.

**Sunday—March 15**
The Meteoritical Society Council will be held from noon to 10 p.m. in the Director’s Conference Room at the LPI.

**Monday—March 16**
The first of the Hal Masursky Lectures will feature Eugene Shoemaker, USGS, and Ellen Stefan, JPL, speaking in a public session in the Building 2 Auditorium, JSC, at 8:00 p.m.

**Tuesday—March 17**
Posters, poster sessions, and exhibits will be held in the Great Room from 7:00 to 9:00 p.m. Complimentary beer and soft drinks will be served.

**Wednesday—March 18**
The JSC Astronomy Seminar will present “Terraforming Earth: Interplanetary Engineering Begins at Home” by Jim Oberg at noon in Building 31, Room 129.

A NASA Managers’ Meeting organized by Don Bogard will be held from 5:00 to 7:00 p.m. in the Gilruth Gym.

The Annual Barbeque Dinner for all registrants will be held at Landolt Pavilion. Guest tickets will be sold at the registration desk.

**Thursday—March 19**
Poster Session II (“keg session”) will be held in the Great Room, LPI, from 7:00 to 9:00 p.m.

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**Proceedings of Lunar and Planetary Science, Volume 22 is Published**

Graham Ryder and Virgil L. Sharpton, eds.
Black and white illustrations and photographs. Hardcover, $25.00

*Proceedings of Lunar and Planetary Science, Volume 22* is the last in the series that began with *Proceedings of the Apollo 11 Lunar Science Conference* in 1970. Editors Ryder and Sharpton note that this latest volume demonstrates that our understanding of the characteristics, origins, and evolution of the planets continues to progress despite pressures from funding constraints on research and new missions. The contents include a review paper on Venus surface mineralogy and a cautionary paper on a possible contamination hazard in the laboratory. The rest of the 38 contributions are grouped by topic: The Surface of Mars; The Cretaceous-Tertiary Boundary and Impact Processes; The Interplanetary Medium Then and Now; Lunar Surface Characterization and Processes; and Basic Magmatic Rocks and Processes. Volume 22 will be distributed to each registrant at the 23rd LPSC. Librarians and others who wish to complete their collection of this series may order it from LPI (see Order Form, this issue).

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**LPSC Proceedings Series Ends**

With the February, 1992, publication of *Proceedings of Lunar and Planetary Science, Volume 22* the venerable series will end after 22 years. In the near future, LPI staff will seek a wide variety of inputs on the needs of our communities for a periodical that could afford more rapid publication of new results and provide a broader scope to reflect the increasingly interdisciplinary nature of today’s research. Members of the community can assist in this process by helping to define the changing needs and publication modes of researchers in lunar, planetary and terrestrial studies.
ICY POLAR CAPS ON MERCURY?

Astronomers have reported finding what may be icy polar caps on Mercury, even though much of the planet experiences temperatures hot enough to melt lead.

Martin Slade (JPL), Duane Muhleman, Bryan Butler (Caltech), and Raymond Jurgens (JPL) used the Goldstone (California) antenna to transmit and the Very Large Array (New Mexico) to receive radar signals to observe Mercury at inferior conjunction (closest distance to Earth). They compared the signature of circular polarization of the signals reflected from Mercury with similar observations of other solar system objects. For example, transmitting radio energy with right circular polarization onto a rocky surface like the Moon’s should produce return signals of mostly left circular polarization. A rough analogy is standing in front of a mirror and raising your right hand; the mirror reflects you raising your left hand. If, however, another mirror reflects the first reflection on its way back to you, you will appear to be raising your right hand. The properties of the target (surface) material determine how much of this multiple scattering of the signal takes place; the surface material also determines how much of the original signal is absorbed rather than reflected back to the observer.

Planetary surfaces are far more complex than flat mirrors, and it is useful to compare the ratio of “same sense” (the same polarization transmitted) to “opposite sense” (the mirror image) polarization in the total return. For most solar system objects, this ratio is much less than 1, but from the radar-bright patches at the north pole of Mercury (image at left) ratios of 1.3 to 1.4 and greater have been obtained. Ratios like this can be explained by the “coherent backscatter” model, which is not well understood theoretically, but observational experience has shown that in the solar system they are associated with an icy surface of some kind: ratios of 1.3 are seen from the south polar cap of Mars, which is known from other evidence to be CO$_2$ ice, and the icy Galilean satellites and rings of Saturn also exhibit ratios greater than 1.

How ice can exist on the innermost planet is under debate, with some workers pointing out that the Sun’s tidal lock on the planet prevents its pole from seasonally tilting to and away from solar heating, and that the ice need not rest on the surface of Mercury but could be detected by radar even if covered by a layer of dust or soil. John Harmon (Cornell) and Slade think they may have detected a suggestion of southern polar caps, as well, using the Arecibo (Puerto Rico) radio telescope as both transmitter and receiver and they will make more observations from Arecibo this spring. Confirming the data with the best configuration of the VLA will have to wait until the next inferior conjunction with Mercury in 1993 when the planet’s extreme southern latitudes can be seen.

GALILEO AT GASPRA: EARLY DATA INTRIGUING

The Galileo spacecraft swept by the asteroid 951 Gaspra in early November, successfully observing the small rocky body with its Solid State Imaging System (SSI) and Near-Infrared Mapping Spectrometer (NIMS)—the first-ever asteroid encounter. Because navigation during the pass was so accurate, finding Gaspra at the bullseye of predicted coverage allowed the spacecraft to transmit a brief portion of the data it gathered to Earth soon after the encounter. The false color image created from views through different filters shows an irregular body with distinct ridges that give it a faceted appearance and suggest that Gaspra is a fragment of a much larger parent dis-
ruptured by catastrophic collision. The ridges appear smoothed, however, which might be
evidence of regolith development—somewhat surprising for a body with an escape
velocity of only 8 m/s². The 160-m-resolution images reveal many small but relatively
few large (1.5-km) craters, which are thought to record Gaspra's history since a last
major collision some 500 million years ago.

Spectral data at the resolution analyzed thus far cannot resolve the question of
whether Gaspra is a primitive, undifferentiated ordinary chondrite or a thermally
evolved stony iron. Spectra are consistent with the body being a shocked ordinary
chondrite, but are also consistent with a silicate body with the addition of metallic Fe.
NIMS data have not been analyzed yet, and the highest-resolution (40-m) data from the
encounter will be played back in April. These observations could help to determine
whether this S-type asteroid is of chondritic or stony-iron composition. A flyby of Ida,
also an S-type asteroid, in August 1993, will provide an interesting comparison.

Galileo's high-gain antenna remains stuck and engineers will continue to subject it
to thermal cycling, pointing the antenna tower sunward, then spaceward, to attempt to
free the lodged umbrella pins. Scientists have also made plans to improve the data rate
from the low-gain antenna by compressing data, should attempts to free the HGA fail.

DATA FROM UARS SHOW LINK BETWEEN CHLORINE, OZONE DEPLETION

Early results from NASA's Upper Atmosphere Research Satellite (UARS) have
confirmed the link between the presence of chlorine monoxide and the depletion of
ozone in the Earth's upper atmosphere. Chlorine monoxide results from the breakdown
of man-made chlorofluorocarbons by the Sun's ultraviolet radiation. The UARS data
examined to date show that extremely high amounts of chlorine monoxide (greater than
one part per billion) occur only where ozone is severely depleted. These first results
from UARS were obtained with the Microwave Limb Sounder (MLS), one of 10 instru­
ments aboard the satellite. MLS detects microwave radiation emitted from chlorine
monoxide, ozone, sulfur dioxide, and water vapor in the atmosphere. The radiation is
analyzed to produce chemical concentration and temperature data at altitudes through­
out the upper atmosphere over almost the entire planet from an orbit 363 miles high.
MLS is also detecting the effects of the large eruption of Mount Pinatubo, Philippines,
in June 1991. Injection of huge amounts of sulfur dioxide by the volcano has created a
band of SO₂ concentration seen by MLS over the tropics. Aerosols formed in the
vicinity of the plume could lead to significant ozone loss in those areas.

Investigators from the Upper Atmosphere Research Satellite mission continue to
report excellent performance of the satellite's sensors and instruments. UARS has been
in orbit for over 120 days with mostly nominal performance being reported. Some soft­
ware errors have been noted and have temporarily caused an instrument anomaly. These
glitches are being corrected as the software itself is becoming better understood. The
science team has reported some excellent early mission results, including one noted by
the High Resolution Doppler Imager science team, which discovered large, violent
windstorms in the Earth's mesosphere located 43 to 60 miles above the Earth's
surface. The biggest such windstorm observed so far stretches from Western Australia
across southern Africa and halfway across the Atlantic Ocean.

A MODEST PROPOSAL FOR OZONE REPAIR

Ralph Cicerone and Scott Elliott (University of California, Irvine) and Richard Turco
(UCLA) have come up with what Cicerone terms "a concept, not a proposal" to remove
chlorine molecules that are destroying ozone over the Antarctic. Their computer model­
ing suggests that reacting the chlorine with simple hydrocarbons such as ethane would
form hydrogen chloride, thus removing free chlorine from the chain of reactions that now are destroying ozone. One way to achieve this would be to inject 50,000 tons of ethane from hundreds of airplanes flying over the region. “We understand... that there could be very unexpected problems arising if you introduce yet another chemical into the system,” admits Cicerone. But the researchers hope to spur other scientists to study ways to repair the damage that is already done.

**MAGELLAN’S PRIMARY TRANSMITTER FAILS; BACKUP WILL RESUME MAPPING**

Flight controllers at the Jet Propulsion Laboratory reported on January 6 that the primary high-data-rate transmitter aboard Magellan has apparently failed. The spacecraft was in the process of returning high-resolution radar data on the Saturday afternoon when the failure occurred. JPL activated the backup transmitter to test its functionality. The backup device had not been used in nearly nine months because of intermittent degraded performance once that unit reaches operating temperatures. The backup unit does work, and engineers have decided to use it to resume mapping on January 24. Meanwhile, the spacecraft’s batteries are being recharged. The backup unit will operate at a lower data rate (about 42% of the previous rate), but resolution should be just as sharp as with previous mapping cycles. The mission’s primary goal was achieved last March when the first complete Venus mapping cycle was accomplished. The second mapping cycle is scheduled to conclude in January, at which time the spacecraft will enter a third phase. Magellan has orbited Venus over 3880 times and provided high-resolution radar imagery of more than 95% of its surface.

**NASA TO STUDY ROCKET FUEL FROM BUCKYBALLS**

A soccerball-shaped carbon molecule may provide an excellent propellant for a type of spacecraft engine that produces thrust by expelling charged atoms or molecules. Stephanie Leifer (JPL) and Winston Saunders (Caltech) propose to use the molecule C₆ₒ as a fuel for ion engines. The engines, which generate thrust by ionizing and accelerating propellants, use less fuel than conventional chemical thrusters. Leifer believes C₆ₒ could reduce the energy required to ionize the propellant. “For applications where it is desirable to operate at relatively low to moderate exhaust velocity, ion engines using low-ion-mass propellants become less efficient. A large molecule such as C₆ₒ would allow for more efficient operation at low exhaust velocities.”

Because the molecule resembles a geodesic dome, C₆ₒ is also called buckminsterfullerene in honor of the dome’s inventor, the late R. Buckminster Fuller. It was recently declared “Molecule of the Year” by the journal *Science* in recognition of the tremendous variety of new research directions C₆ₒ and the family of fullerenes have inspired in many fields of applied science. JPL and Caltech will investigate the basic properties of the molecule important for ion propulsion and will evaluate it as a fuel in a small ion engine testbed. The first practical application of ion engines may be in orbital transfer missions and station-keeping for satellites in GEO. Describing a scenario that has become typical in labs across the country that begin to tinker with “buckyballs,” Saunders noted that he and Liefer “cooked up this idea to use C₆ₒ and within two weeks we had filed patent disclosures. It’s the kind of synergetics Buckminster Fuller advocated.”
## PUBLICATIONS FROM LPI

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Consortium Finds Evidence of Impact Origin from Samples

A consortium of researchers including J. M. Quezada Muñeton (Pemex, Mexico), L. E. Marin (Geophysics Institute, UNAM, Mexico), V. L. Sharpton, G. Ryder, and B. Schuraytz (Lunar and Planetary Institute, Houston), and B. G. Dalrymple (U.S.G.S. Menlo Park) has found clear and certain evidence that the Chicxulub structure on the Yucatan coast was created by impact of an asteroid or comet. The group is currently doing a detailed analysis of core samples obtained by Pemex from exploratory wells drilled near the center of the formation.

Shock Features, Glasses Apparent

Evidence of shock metamorphism that results from the enormous pressures created by impact is abundant in the form of multiple sets of planar deformation features in quartz and feldspar. A range of shock pressures from 6-10 GPa up to 23 GPa suggests that the breccias analyzed contain a mixture of material from different distances from the center of impact. Some of the clasts in the breccia are roughly andesitic in composition and retain planar shock features; they contain partially digested bits of quartz and feldspar that indicate that these are melt rocks. The samples also contain impact glasses and fragments of basement rock (the layer that underlies the Yucatan platform) that show shock effects. Composition of the glasses and basement clasts is consistent with an impact into continent or continental shelf material. Interestingly, the glasses analyzed so far do not show the high-Ca chemistry reported for a layer of tektites found in Haiti thought to be ejecta from the impact, although this finding doesn't rule out a genetic relationship.

Examination of the basement fragments indicates a target of medium to high grade metamorphic rock, possibly a granitic gneiss containing quartz and alkali feldspars. The grains show signs of considerable deformation and shearing that occurred before the impact; further study should yield a better understanding of the tectonic history of the Yucatan platform.

Iridium, found abundantly at K/T sites around the world, has not been detected in the samples analyzed. It is possible that an impact of this magnitude could generate pressures and temperatures that would completely vaporize traces of the projectile at ground zero while still distributing Ir globally as fallout.

Age Not Clearly Determined

Pemex research reports an 80-million-year-old age for the samples based on detailed stratigraphic and paleontological evidence, which would seem to cast doubt on a K/T (65-million-year-old) age for the Chicxulub rocks. In addition, J. M. Quezada Muñeton studied several K/T boundary exposures in Chiapas, Mexico, just 550 km from the center of Chicxulub and found no trace of the breccia deposit that would be expected from an impact so nearby. The consortium of investigators is conducting $^{40}$Ar-$^{39}$Ar dating of the Chicxulub samples and hopes to be able to prove or disprove the case for Chicxulub as the K/T extinction trigger.
# 1992 is International Space Year

A host of activities, events, and meetings around the world will focus on space science and exploration with a special emphasis on education. The yearlong celebration is coordinated by the national space agencies of 29 countries, the United Nations, 9 international organizations, and many other groups, large and small. Some of the highlights are included in the *LPIB* Calendar. For a more complete list, refer to the special ISY insert in the January/February issues of *Ad Astra* or *Final Frontier* or contact the US-ISY Association, 600 Maryland Avenue NW, Suite 600, Washington DC 20024; phone: 202-863-1734; FAX: 202-863-5240.

## MARCH

1-5


2-6

IAU Symposium 154 Infrared Solar Physics 1μm to 1 mm, Tucson, Arizona. Contact: Douglas Rabin, National Solar Observatory, P.O. Box 26732, Tucson AZ 85726-6732. Phone: 602-325-9331; FAX: 602-325-9278. 
SPAN: 5355: rabin
Internet: rabin@noao.edu

16-20


17-20

Recent Advances In High Energy Astronomy, Toulouse, France. Contact: Pierre Mandrou, 9 Av. du Colonel Roche, 31027 Toulouse France. Phone: 33-61.55.66.88; FAX: 33-61.55.67.01; Telex: 531729 UNSPAT Toulouse
SPAN: 17449: RAMON

23


23-26

Space Commerce 92, Montreux, Switzerland. Contact: (in North America) George Suter, Access Management Corporation, 7 Woodlawn Green, Suite 212, Charlotte NC 28217. Phone: 704-525-7030; FAX: 704-527-3788; Telex: 9102401552 access cha. (outside North America) Norman Neve, Permanent Secretariat, Space Commerce 90, P.O. Box 97, CH-1820 Montreux, Switzerland. Phone: 41 21 963 23 54; FAX: 41 21 963 78 95; Telex: 453 222 mtx ch.

## MARCH (CONTINUED)

23-27

AGU Chapman Conference on Climate, Volcanism, and Global Change, Hilo, Hawaii. Contact: Stephen Self, Department of Geology and Geophysics, University of Hawaii at Manoa, Honolulu HI 96822; or Richard P. Turco, Department of Atmospheric Sciences, University of California at Los Angeles, Los Angeles CA 90024-1565.

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## APRIL

6-7

Joint Workshop on New Technologies for Lunar Resource Assessment, Santa Fe, New Mexico. Contact: Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; FAX: 713-486-2160.

6-10


27


## MAY

12-15

### MAY (CONTINUED)

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### JUNE (CONTINUED)

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<tr>
<td>19-21</td>
<td>Seventeenth Symposium on Antarctic Meteorites, Tokyo, Japan. Contact: Keizo Yanai, National Institute of Polar Research, 9-10, Kaga 1-Chome, Itabashi-ku, Tokyo, Japan. Phone: 03-3962-4711 ext. 155; FAX: 03-3962-5711.</td>
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<td>24</td>
<td>Experimental Planetology and Cosmic Mineralogy (special symposium at IGC), Kyoto, Japan. Contact: IGC-92 Office, P.O. Box 65, Tsukuba, Ibaraki 305,</td>
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### CALENDAR 1992

#### AUGUST (CONTINUED)

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<td>24</td>
<td>29th International Geological Congress</td>
<td>Kyoto, Japan</td>
<td>Phone: 81-298-54-3627; FAX: 81-298-54-3629; Telex: 3652511 GSJ J.</td>
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<td>Sudbury Impact Structure Meeting</td>
<td>Sudbury, Canada</td>
<td>Contact: Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2150; FAX: 713-486-2160.</td>
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#### SEPTEMBER (CONTINUED)

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<td>10-12</td>
<td>MSATT Workshop on Chemical Weathering on Mars</td>
<td>Cape Canaveral/Orlando, Florida</td>
<td>Contact LPI-MSATT Chemical Weathering Workshop, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2150; FAX: 713-486-2160.</td>
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<td>14-17</td>
<td>4th International Colloquium on Atomic Spectra and Oscillator Strengths for Astrophysical and Laboratory Plasmas</td>
<td>Gaithersburg, Maryland</td>
<td>Contact: Lori Phillips, National Institute of Standards and Technology, Gaithersburg MD 20899. Phone: 301-975-4513; FAX: 301-926-1630.</td>
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<td>15-19</td>
<td>The Impact of Astrometry on Astrophysics and Geodynamics</td>
<td>Shanghai, China</td>
<td>Contact: Ivan I. Mueller, Department of Geodetic Science and Survey-</td>
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#### OCTOBER

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<td>7-11</td>
<td>American Geophysical Union, Fall Meeting</td>
<td>San Francisco, California</td>
<td>Contact: AGU Meetings, 2000 Florida Avenue NW, Washington DC 20009. Phone: 202-462-6903.</td>
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Twenty-Third Lunar and Planetary Science Conference

Preliminary Program
March 16-20
PRELIMINARY CONFERENCE PROGRAM
23rd Lunar and Planetary Science Conference
March 16-20, 1992

* Designates Speaker

Monday, March 16, 1992
MAGELLAN AT VENUS: THE GLOBAL PERSPECTIVE EMERGES
8:30 a.m. Room A

Chairmen: R. E. Arvidson
            R. S. Saunders

Saunders R. S. Schubert G. Squyres S. W. Stofan E. R.

Venus Tectonics: An Overview of Magellan Observations

Suppe J.* Connors C.

Linear Mountain Belts andRelated Deformation on Venus

Schubert G.*

Mantle Dynamics and Tectonics on Venus

The Uniform Distribution but Nonuniform Modification of Impact Craters on Venus

The Resurfacing History of Venus: Constraints from Impact Crater Distribution

Head J. W.* Crumpler L. S. Aubele J. C.

Venus Global Volcanism: Characteristics and Distribution of Edifices and Deposits and Implications for Resurfacing Style and Rates

Arvidson R. E.* Greeley R. Malin M. Saunders R. S. Izenberg N. Plaut J. J. Stofan E.
Surface Modification of Venus as Inferred from Magellan Observations of Plains and Tesserae

Wood J. A.*

Venus: Surface Chemistry and Modification Processes

Baker V. R.* Komatsu G. Gulick V. C. Kargel J. S.

Venusian Valleys and Channels

Saunders R. S.* Stofan E. R.

Science Questions for the Magellan Continuing Mission

Monday, March 16, 1992
METEORITE PARENT BODIES
8:30 a.m. Room B

Chairmen: A. Graham
            E. Scott


Thermal History of Chondrites: Hot Accretion vs. Metamorphic Reheating

Steele I. M.*

Olivine Zoning as Function of Crystallographic Orientation; Implications for Diffusion in Olivine
Burkland M. K. * Swindle T. D.
*Studies of the Diffusion Properties of the I-Xe System in Bjurbole*

Benoit P. H. Sears D. W. G. *
*The Break-up of the H Chondrite Parent Body and the Delivery of Fragments to Earth*

Fujiwara T. Nakamura N. *
*Additional Evidence of a Young Impact-Melting Event on the L-Chondrite Parent Body*

Perron C. * Bourot-Denise M.
*Inclusions in the Metal of Tieschitz and Krymka*

Rubin A. E. *
*Petrography of Metallic Cu in Ordinary Chondrites*

Brearley A. J. *
*Phyllosilicates in the Matrix of the Unusual Carbonaceous Chondrite, LEW 85332 and Possible Affinities to CI Chondrites*

Graham A. L. * Lee M.
*The Matrix Mineralogy of the Vigarano (CV3) Chondrite*

Llorca J. * Brearley A. J.
*Alteration of Chondrules in ALH 84034, an Unusual CM2 Carbonaceous Chondrite*

Zolensky M. E. * Weisberg M. K. Buchanan P. C. Prinz M. Reid A. Barrett R. A.
*Mineralogy of Dark Clasts in CR Chondrites, Eucrites and Howardites*

Xiao X. Lipschutz M. E. *
*Carbonaceous Chondrites: Co-Variation of Volatile Element Contents and Siderophile Element Ratios in Petrographic Types 2-6*

Yanai K. *
*Bulk Composition of Yamato-793575 Classified as Carlisle Lakes-type Chondrite*

Monday, March 16, 1991

MARE BASALTS, KREEP, AND COPERNICAN EJECTA
8:30 a.m. Room C

Chairmen: C. K. Shearer
G. A. Snyder

Marvin U. B. * Holmberg B. B.
*Highland and Mare Components in the Calcalong Creek Lunar Meteorite*

Boesenberg J. S. * Delaney J. S.
*Lithic Clasts in Elephant Moraine 87521 Sample Two VLT Fractionation Series*

James O. B. * McGee J. J.
*Compositional Variations in Mare-Basalt Plagioclase Produced by Differing Crystallization Regimes*

Jerde E. A. * Snyder G. A. Taylor L. A.
*Apollo 11 High-K Basalts: An Apollo 17 Connection and Evidence for neoKREEP*

*Isotopic Constraints on the Lunar Upper Mantle: Evidence from High-Ti Basalts*
Misawa K.*, Tatsumoto M. Yanai K.
U-Th-Pb, Sm-Nd, and Rb-Sr Isotopic Systematics of Lunar Meteorite Asuka-31

Shearer C. K.* Papike J. J.
Relationship Between Apollo 12 High-Ti, Red-Picritic Glass and High-Ti Basaltic Magmatism

The Petrogenesis of Apollo 12 Mare Basalts, Part I: The "Lumpers" Versus the "Splitters"

Wentworth S. J.* McKay D. S. Bogard D. D.
Apollo 12 Ropy Glasses Revisited

Bogard D. D.* Garrison D. H. McKay D. S. Wentworth S. J.
The Age of Copernicus: New Evidence for 800±15 Million Years

Vetter S. K.* Shervais J. W.
Whole Rock Major Element Chemistry of KREEP Basalt Clasts in Lunar Breccia 15205: Implications for the Petrogenesis of Volcanic KREEP Basalts

Haskin L. A.* Jolliff B. L. Colson R. O.
On Partitioning of REE Between Whitlockite and Apatite in High-ITE Lunar Rocks: Petrologic Consequences

Chairmen: C. Johnson
R. Herrick

Sjogren W. L.*
Venus Gravity: Status and New Data Acquisitions

Highlander III: On the Origin and Evolution of Large Uplands on Venus

Lenardic A.* Kaula W. M. Bindschadler D. L.
Maxwell and the Andes: Analogous Structures?

Price E. J.* Connors C. Dahlen F. A. Suppe J. Williams C. A.
Accretionary Wedge Mechanics on Venus: A Brittle/Ductile Critical Taper Model

Zuber M. T.* Parmentier E. M.
The Contribution of Dynamic Topography Due to Lithosphere Compression to the Structure of Mountain Belts and Ridge Belts on Venus

Pronin A.* Kreslavsky M.
A Possible Mechanism of Gravity Relaxation on Venus

Namiki N.* Solomon S. C.
The Gabbro-Eclogite Phase Transition and the Elevation of Mountain Belts on Venus

Banerdt W. B.* Sammis C. G.
Parallel Fracture Patterns on the Plains of Venus

Herrick R. R.* Phillips R. J.
Comparison of Magellan Data with the Interior Density Structure of Venus
Johnson C. L.* Sandwell D. T.

*Flexure on Venus: Implications for Lithospheric Elastic Thickness and Strength*

Sandwell D. T.* Schubert G.

*Is the Venusian Lithosphere Subducting?*

Burt J. D.* Head J. W.

*Thermal Buoyancy on Venus: Underthrusting vs. Subduction*

Davies M. E.* Colvin T. R. Rogers P. G. Chodas P. W. Sjogren W. L.

*Venus’ Rotation Period and Pole Direction*

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Monday, March 16, 1992
ASSORTED ACHONDRITES
1:30 p.m. Room B

Chairmen: G. A. McKay
R. N. Clayton

Harvey R. P.* McSween H. Y. Jr.

*Parental Magmas of the Nakhlites Re-Examined*

Wadhwa M.* Crozaz G.

*REE in Minerals in Nakhla and Lafayette: A Comparative Study of Trace Element Microdistributions*

McKay G.* Le L. Wagstaff J.

*REE Partition Coefficients for the Nakhla Parent Melt*


*LEW88516: A New Shergottite from Antarctica*

Boynton W. V.* Hill D. H. Kring D. A.

*The Trace-Element Composition of Lew 88516 and its Relationship to SNC Meteorites*

Treiman A. H.* Barrett R. A. Gooding J. L.

*The Lafayette Meteorite: Preterrestrial Aqueous Alterations*

Miyamoto M.* Takeda H.*

*Two-Stage Cooling History of the Moore County Eucrite*

Shearer C. K.* Papke J. J.

*Origin of Olivine Diogenites and Their Relationship to Basaltic Magmatism on the Eucrite Parent Body*

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

*147Sm-143Nd Ages and 146Sm-142Nd Formation Intervals of Basalt Fragments from the HED Parent Body*

Ireland T. R.* Saiki K. Takeda H.

*Age and Trace-Element Chemistry of Yamato 791438 Zircon*

Jurwicz A. J. G.* McKay G. A.

*Chondrite Melting Experiments: Can Angrite LEW 87051 be Produced by Partial Melting of a CV or CM Chondrite?*
Clayton R. N.* Mayeda T. K. Nagahara H.
Oxygen Isotope Relationships Among Primitive Achondrites

Kring D. A.* Boynton W. V.
The Trace-Element Composition of Eagles Nest and its Relationship to Other Ultramafic Achondrites

Monday, March 16, 1992
ORIGIN AND EVOLUTION OF PLANETARY SYSTEMS
1:30 p.m. Room C

Chairmen: P. Cassen
J. A. Nuth III

Wolszczan A.*
Discovery of Planets Around a Millisecond Pulsar

Malhotra R.* Black D. Eck A. Jackson A.
Constraints on the Putative Companions to PSR1257+12

The Detection of Methanol and Diamonds in Dense Molecular Clouds

Kim J. S.* Marti K.
Evidence for Neutron Irradiation in the Early Solar System

Boss A. P.*
Thermal Structure of the Solar Nebula

Cassen P.*
Thermal Models of the Primitive Solar Nebula

Stepinski T. F.* Levy E. H.
On the Generation of Magnetic Fields in the Solar Nebula at the Location of the Present-Day Asteroid Belt

Stewart G. R.*
Generalized Theory for Planetesimal Dynamics

Williams D. R.* Wetherill G. W. Stewart G. R.
Growth and Thermal Evolution of Planetesimals

Wetherill G. W.*
Simultaneous Growth and Orbital Evolution of Terrestrial and Asteroidal Embryos

Cameron A. G. W.*
The Giant Impact Revisited

Drobyshevski E. M.*
Mercury's Impact-Induced Self-Destruction and Early Impact History of Inner Planets

Pepin R. O.*
Evolution of Earth's Noble Gases from Primordial Distributions: Consequences of Assuming Hydrodynamic Loss Driven by Giant Impact
Monday, March 16, 1992
PUBLIC SESSION
HAROLD MASURSKY LECTURES
8:00 p.m. Bldg. 2 Auditorium

Chairmen: Michael Griffin
Wesley T. Huntress

Eugene Shoemaker
U.S. Geological Survey

Ellen Stofan
Jet Propulsion Laboratory

Tuesday, March 17, 1992
VENUS: TECTONISM AND VOLCANIC ASSOCIATIONS
8:30 a.m. Room A

Chairmen: S. E. Smrekar
D. A. Senske

Ivanov M. A.* Tormanen T. Head J. W.
Global Distribution of Tesserae: Analysis of Magellan Data

deCharon A. V.* Stofan E. R.
Complex Rridged Terrain at Phoebe Regio, Venus from Magellan Data

Bilotti F.* Suppe J.
Planetary Distribution and Nature of Compressional Deformation Around Artemis Corona, Venus

Törmänen T.* Raitala J.
Tectonics of Southwestern Audra Planitia on Venus from Magellan Data: Evidence of Underthrusting

Hansen V. L.*
Regional Non-Coaxial Deformation on Venus: Evidence from Western Itzpapalotl Tessera

Pohn H. A.* Schaber G. G.
Indenter Type Deformation on Venus as Evidence for Large-Scale Tectonic Slip, and Multiple Strike-Slip Events as a Mechanism for Producing Tesselated Terrain

Baer G.* Schubert G. Bindschadler D. L. Stofan E. R.
Spatial and Temporal Relations Between Coronae and Extensional Belts, Northern Lada Terra

Senske D. A.* Head J. W.
Zones of Extension and Rifting on Venus: Characteristics and Distribution

Roberts K. M.* Head J. W. Lancaster M. G. Guest J. E.
Volcanism and Rifting Along the Northern Edge of Lada Terra, Venus

Parker T. J.* Komatsu G. Baker V. R.
Longitudinal Topographic Profiles of Very Long Channels in Venusian Plains Regions

Pavri B.* Head J. W. Wilson L. Klose B.
Steep-sided Domes on Venus: Distribution, Associations, and Implications for Petrologic Models
Guest J. E. • Bulmer M. H. • Beretan K. • Michaels G. • Saunders S.
Gravitational Collapse of the Margins of Volcanic Domes on Venus

Head J. W. • Crumpler L. S. • Aubele J. C.
A Major Global-Scale Concentration of Volcanic Activity in the Beta-Atla-Themis Region of Venus

Tuesday, March 17, 1992
REDUCED METEORITES
8:30 a.m. Room B

Chairmen: M. K. Weisberg
A. H. Spitz

Chang Y. • Benoit P. H. • Sears D. W. G.
Bulk Compositional Confirmation of the First EL3 Chondrite and Some Implications

Weisberg M. K. • Fogel R. A. • Prinz M.
FeO-rich Silicates and Reduction Processes in the Unequilibrated Enstatite Chondrites

El Goresy A. • Wadhwa M. • Nagel H.-J. • Zinner E. K. • Janicke J. • Crozaz G.
55<sup>Cr</sup>-53<sup>Mn</sup> Systematics of Mn-Bearing Sulfides in Four Enstatite Chondrites

Lodders K. • Fegley B. Jr.
Lanthanide and Actinide Condensation into Oldhamite Under Reducing Conditions

Dickinson T. L. • Lofgren G. E.
Melting Relations for Indarch (EH4) Under Reducing Conditions

Gaffey M. J. • Reed K. L. • Kelley M. S. •
E-Type Apollo Asteroid (3103) 1982BB: A Hungaria-Derived Near-Earth Source Body for the Aubrites

Treiman A. H. • Berkley J. L.
A New Ureilite: Preliminary Data on Nuevo Mercurio (B)

Spitz A. H. •
ICP-MS Trace Element Analysis of Ureilites: Evidence for Mixing of Distinct Components

Goodrich C. A. • Lugmair G. W.
Addition of LREE-Enriched Material to a Ureilite at 4.23 Ga: Evidence for Episodic Metasomatism?

Scott E. R. D. • Keil K. • Taylor G. J.
Origin of Ureilites by Partial Melting and Explosive Volcanism on Carbon-rich Asteroids

Warren P. H. • Kallemeyn G. W.
Ureilites: The Graphite f(O<sub>2</sub>) Buffer, Explosive Volcanism, and the Gross Dissipation of Basalt from the Parent Asteroid(s)

Olsen E. • Davis A. M. • Moore C. B. • Clayton R. N. • Mayeda T. K. • Steele I. M.
Puente Del Zacate: First Occurrence of a Silicate Inclusion in a Type III Iron (But What Is It?)

Petaev M. I. • Ariskin A. A.
Thermodynamic Modelling of the Origin of the Divnoe Achondrite
Tuesday, March 17, 1992
EVOLUTION OF THE LUNAR CRUST AND MANTLE
8:30 a.m. Room C

Chairmen: R. L. Korotev
G. Ryder

Basu A.* Wentworth S. J. McKay D. S.
Preliminary Results of a Petrographic Investigation of Apollo 16 Core 60014

Korotev R. L.*
Compositional Differences Between Feldspathic Fragmental Breccias and Ancient Regolith Breccias from Apollo 16

Shih C.-Y.* Wiesmann H. Nyquist L. E.
K-Ca Age of Lunar Granites

Premo W. R.* Tatsumoto M.
U-Pb Isotopes in Dunite 72415

Takeda H.* Miyamoto M. Mori H.
Mineralogy and Cooling Histories of Lunar Granulites and Related Lunar Meteorites

Phinney W. C.*
D's for Cr, Mn, and Ti as Tests of Igneous vs. Subsolidus Equilibration of Mafic Minerals in Lunar Rocks

Jolliff B. L.*
Mafic, Ferroan Lithologies from North Ray Crater, Apollo 16: Implications for Crustal Abundance

Ryder G.*
Lunar Highlands Totality from Bits and Pieces: A Whole-Rock-Chemistry-Free Characterization of an Evolved Hypabyssal Igneous Gabbro Schlieren from the Apollo 17 Landing Site

Longhi J.* Fram M. S. Vander Auwera J. Montieth J.
Pressure Effects in Anorthositic and Related Magmas

Nyquist L. E.* Shih C.-Y.
Nd Isotopic Evidence for Lunar Crust/Mantle Mixing - Possibly During a Basin-Forming Impact

Hess P. C.*
Dissolution of Plagioclase and the Origin of Mg-Suite Parent Magmas

Solomatov V. S.* Stevenson D. J.
Comparison of Lunar and Terrestrial Magma Oceans

Tuesday, March 17, 1992
OUTER SOLAR SYSTEM/REMOTE SENSING: LABORATORY
8:30 a.m. Room D

Chairmen: D. Domingue
L. Lebofsky

Colwell J. E.* Esposito L. W.
Formation of Narrow Planetary Rings by Satellite Disruption

Kuramoto K.* Matsui T.
Loss of Ice from Accreting Giant-Icy-Satellites by the Escape of Hot Proto-Atmospheres
Malcuit R. J.* Mehninger D. M. Winters R. R.
*Numerical Simulation of Retrograde Tidal Capture of a Triton-like Planetoid by a Neptune-like Planet: Two-Dimensional Limits of a Stable Capture Zone

Nash D. B.* VanHecke G. R.
Chemical Working Fluid Mechanism for Recycling and Exothermic Heating of Io's Surface

Rudnyk M.* Pieri D.
Lineament Types as Evolutionary Stages for Development of Ridges/Scarps on Europa

Pappalardo R.* Greeley R.
Single-Plate Rifting Model for Ridge and Trough Terrain on Icy Satellites

Henderson B. G.* Jakosky B. M. Randall C. E.
Multiple Scattering and Polarization of Thermal Emission from Particulate Planetary Surfaces

Hapke B.* Nelson R. Smythe W. Gharakanian V. Hom L. Lane A.
Opposition Effect and Negative Polarization: Laboratory Studies

Oehler A.* Neukum G.
First Results from the DLR Goniospectrophotometer

Wald A. E.* Salisbury J. W.
Angular Dependence of Spectral Emissivity of Quartz and Basalt

Dilley J.*
The Coefficient of Restitution for Collisions of Icy Spheres

Kane K. Y. Cremers D. A.*
Remote Elemental Analysis of Planetary Surfaces Using Laser-Induced Breakdown Spectroscopy

Tuesday, March 17, 1992
Session Dedicated to William Quaide on the Event of his Retirement
VENUS VOLCANISM
1:15 p.m. Room A

Chairmen: J. J. Plaut
K. M. Roberts

Burnett D.
Introduction

Holloway J. R.*
Volcanic Degassing Under Thick Atmospheres: Consequences for Magmatic Volatiles on Venus

Sakimoto S. E. H.* Zuber M. T. Marsh B. D.
Cooling of Ascending Magma on Venus and Earth

Wilson L.* Head J. W.
Magma Reservoirs and Neutral Buoyancy Zones on Venus: Implications for the Formation and Evolution of Volcanic Landforms

Parmentier E. M.* Hess P. C.
Chemical Differentiation of a Convecting Planetary Interior: Consequences for One-Plate Planets such as Venus
Kargel J. S.* Komatsu G.
The Composition of Venus and the Petrogenesis of Venusian Silicate Lavas

Klose K. B.* Zolotov M. Yu.
Chemical Weathering of Evolved Igneous Rocks on Venus

Basilevsky A. T.* Weitz C. M.
Venera 9, 10 and 13 Landing Sites as seen by Magellan

Gregg T. K. P.* Greeley R.
Formational Constraints on Venusian “Canali”

Robinson C. A.* Wood J. A.
Recent Volcanic Activity on Venus: Evidence from Emissivity Measurements

Keddie S. T.* Head J. W.
Sapas Mons Venus: Sequence of Events in a Large Shield Volcano

Lancaster M. G.* Guest J. E. Roberts K. M. Head J. W.
“Great” Lava Fields on Venus

Campbell B. A.*
Comparison of Magellan Measurements of Surface Roughness on Venus to Topographic Profiles of Terrestrial Basaltic Lava Flows

Plaut J. J.*
Multiple Views of Venus: Geological Significance of Scattering Law Anomalies

Tuesday, March 17, 1992
CHONDRULES
1:30 p.m. Room B

Chairmen: J. M. Dehart
D. W. G. Sears

Simon S. B.* Grossman L.
Petrography, Composition and Origin of Chromian Spinel Crystals Separated from the Murchison Meteorite

Wasson J. T.* Krot A.
Oxidizing Conditions in the Solar Nebula and the Origin of Chromite Chondrules

Lu J.* Sears D. W. G. Benoit P. H. Prinz M. Weisberg M. K.
The Four Primitive Chondrule Groups and the Formation of Chondrules

Jones R. H.*
Petrology of FeO-poor, Porphyritic Pyroxene Chondrules in the Semarkona Ordinary Chondrite

DeHart J. M.* Lofgren G. E.
Annealing Studies of Type A Chondrule Analogs

Lofgren G. E.* DeHart J. M.
Dynamic Crystallization Studies of Enstatite Chondrite Chondrules: Cathodoluminescence Properties of Enstatite

Connolly H. C. Jr.* Hewins R. H.
Chondrule Modifications as a Possible Indicator of Rim-Forming Mechanisms
Kennedy A. K.* Lofgren G. E. Wasserburg G. J.  
A Study of Trace Element Partitioning Between Olivine, Orthopyroxene and Melt in Chondrules: Equilibrium Values and Kinetic Effects

Lofgren G. E.* Dehart J. M. Dickinson T. L.  
Relict Enstatite and Olivine in Porphyritic Chondrules from Enstatite Chondrites Formed by Partial Melting of Precursor Material

Palme H.* B. Spettel Kurat G. Zinner E.  
Origin of Allende Chondrules

Hervig R. L.* Steele I. M.  
Oxygen Isotopic Analysis of Allende Olivine by Ion Microprobe and Implications for Chondrule Origin

Kurat G.* Brandstätter F. Zinner E. Palme H. Spettel B.  
A SIMS Study of Some Allende Chondrules: Support for the New Chondrule Model

Sahagian D. L. Hewins R. H.*  
The Size of Chondrule-Forming Events

Tuesday, March 17, 1992
IMPACT CRATERING: THEORY AND EXPERIMENTATION  
1:30 p.m.  Room C

Chairmen:  D. A. Crawford  
C. L. Smither

Crawford D. A.* Schultz P. H.  
The Production and Evolution of Magnetic Fields During Hypervelocity Impacts

Schmidt R. M.*  
Experiments to Investigate Atmospheric Effects on Crater Size

Barnouin O.* Schultz P. H.  
A Continuum Model for Atmospheric Response to an Advancing Ejecta Curtain

Housen K. R.*  
Crater Ejecta Velocities for Impacts on Rocky Bodies

Asphaug E.* Melosh H. J. Ryan E.  
Theoretical Predictions for Fragment Size Distributions

Ryan E. V.* Asphaug E. Melosh H. J.  
Hydrocode Simulation of Explosive Disruption: External Pressure and Gravity

Smither C. L.* Ahrens T. J.  
Energy Partitioning and Ejecta Escape for Normal and Oblique Impacts on Self Gravitating Planetary Systems

Yang W.* Ahrens T. J.  
Silicate Jet Ejecta Mass and Geometry upon Oblique Impact

Brackett R. A.* McKinnon W. B.  
Pressure Attenuation in Impacts Determined Using a Finite Shell Model: Implications for Melt and Vapor Scaling

O'Keefe J. D.* Ahrens T. J.  
Melting and Shock Weakening Effects on Impact Crater Morphology
Mittlefehldt D. W.* See T. H. Hörz F.
 Projectile Dissemination in Impact Melts from Meteor Crater, Arizona

Graup G.* Palme H. Spettel B.
 Trace Element Stratification in the Stevns Klint Cretaceous/Tertiary Boundary Layers

Ahrens T. J. Rowan L. Yang W. Becker R. H.* Pepin R. O.
 Impact Release of Noble Gases from the Murchison Meteorite

Tuesday, March 17, 1992
POSTER SESSION I
7:00 - 9:00 P.M. LPI

VENUS GEOMORPHOLOGY

Clark J. Alexander D. Andres P. Stanley C.
 Image Processing Data Products for the Magellan Mission

Finn V. J. Baker V. R.
 Venus and Earth: Morphostructural Comparison and Endogenic Implications

Gulick V. C. Baker V. R. Komatsu G.
 Channel and Valley Morphology on Venus: An Updated Classification

Kucinskas A. B. Turcotte D. L. Huang J. Ford P. G.
 A Spectral Study of Venus Topography in Two Selected Equatorial Regions

Landheim R. Geringer M. A. Greeley R. Barker J.
 Radar-Visible Wind Streaks on Venus Compared with Terrestrial Analogs

 Weitz C. M.
 Geologic Settings of Aeolian Features on Venus

Weitz C. M. Elachi C. Blom R. Greeley R.
 Two Possible Dune Fields on Venus

Törmänen T.
 Geomorphic/Geologic Map of Audra Planitia Region on Venus Based on Magellan Radar Image Mosaic CI-MIDR.60N070;1

VENUS TECTONICS

Wieczorek M. A. Tatsumura M. J. Leyva I. A. Desmarais K. Johnson J. Koopowitz L. Landheim R.
 Bindschadler D. L.
 Morphologic Mapping of the Region from Northern Ovda Regio to Southern Tellus Regio, Venus

Bindschadler D. L. Tatsumura M. J.
 Tellus Regio, Venus: Preliminary Magellan Observations of a Region of Complex Ridged Terrain

Grosfils E. B. Head J. W.
 Venustian Stress Directions from Radial Fractures

Ghail R. Wilson L.
 Subduction at Artemis Chasma
Michaels G. A. Saunders R. S. Stofan E. R.
Morphology of Regional Fracture Systems on Venus

Parfitt E. A. Head J. W.
A Survey of Radial Fracture Systems on Venus

Smrekar S. E. Solomon S. C.
Tectonic Implications of Gravitational Spreading Models for Ishtar Terra, Venus

VENUS IMPACT CRATERS

Bright Crater Outflows on Venus

Duval D. M. Wood C. A.
Impact Crater Flows on Venus: Morphological Evidence for Complex Ejection Dynamics

Edmunds M. S. Sharpton V. L.
Characterization of Ejecta Facies Around Large Venusian Craters: Implications for the Origin of Flow-like Ejecta

Garvin J. B. Schaber G. G.
Morphometry of Large Impact Craters on Venus: Comparisons with Terrestrial and Lunar Examples

Grieve R. A. F. Cintala M. J.
Venusian Impact Craters: Effects of Differential Scaling

Ivanov B. A. Provalov A. A. Rybakov V. A.
The Possible Radiative Heat Damage of the Venusian Surface

Leff C. Morrison A. D.
The Small Craters of Venus - an Inspection Using Magellan Data

Moore H. J. Weitz C. M. Schaber G. G.
Cochran and Other Venusian Impact Craters

Schenk P. Sharpton V. L.
The Simple-to-Complex Crater Transition on Venus

Schultz P. H.
Wake-Blast Effects in Laboratory Experiments and on Venus

Weitz C. M. Moore H. J. Schaber G. G.
Low-Emissivity Impact Craters on Venus

Nikolaeva O. V. Klose K. B.
The Giant Impact: A New Paradigm for the Origin of the Global Crustal Dichotomies of the Terrestrial Planets

PLANETARY VOLCANISM

Crumpler L. S. Head J. W. Aubele J. C. Guest J. Saunders R. S.
Venus Volcanism: Global Distribution and Classification from Magellan Data

Aubele J. C. Head J. W. Crumpler L. S. Guest J. E. Saunders R. S.
Fields of Small Volcanoes on Venus (Shield Fields): Characteristics and Implications

Wiles C. R. Forshaw M. R. B.
Automated Detection and Measurements of Small Volcanoes on Venus
IMPACT CRATERING: THEORETICAL ASPECTS

Zenchenko E. V. Tsvetkov V. M.
The Effect of Target Properties on Cratering Mechanism

Crawford D. A. Schultz P. H.
Experimental Investigations of Impact-Generated Magnetic Fields

Ivliev A. I. Kashkarov L. L. Baryshnikova G. V. Badjukov D. D.
Thermoluminescence of Oligoclase as Indicator of Shock Metamorphic Processes

Gratz A. J. Nellis W. J. Hinsey N.
Laboratory Simulations of Explosive Volcanism and Implications for the K/T Boundary

Gratz A. J. Nellis W. J. Hinsey N.
Shock Deformation and Transformation in the SiO₂ System

Oberbeck V. R. Aggarwal H.
Impact Crater Deposit Production on Earth
McHone J. F. Dietz R. S.
Earth's Multiple Impact Craters and Astroblemes

Oberbeck V. R. Marshall J. R.
Impacts, Flood Basalts, and Continental Breakup

TEKTITES

Izett G. A. Obradovich J. D.
Laser-Fusion 40Ar, 39Ar Ages of Australasian Tektites

OUTER SOLAR SYSTEM

Boyce J. M. Rogers P. G.
The Canteloupe Terrain of Triton

Croft S. K.
Aspects of Tectonics on Icy Satellites

McEwen A. S. Isbell N. R. Pearl J. C.
Io Thermophysics: New Models with Voyager 1 Thermal IR Spectra

Schenk P.
Volcanism on Triton

LABORATORY REMOTE SENSING

Hudgins D. M. Sandford S. A. Allamandola L. J. Tielens A. G. G. M.
The Measurement of Optical Constants from Interstellar and Solar System Ice Analogs Using Transmission Infrared Spectroscopy

Salisbury J. W. Wald A. E.
The Role of Volume Scattering in Reducing Spectral Contrast of Reststrahlen Bands in Spectra of Powdered Minerals

Shepard M. K. Arvidson R. E. Guinness E. A. Deering D. W.
Volume and Surface Scattering Properties of Lunar Lake Playa, Nevada

SOLAR SYSTEM FORMATION

Hood L. L. Horanyi M.
Gas Dynamic Heating of Chondrule Precursor Grains: Mechanisms for Generation of Nebular Shock Waves

Nuth J. A. Berg O. Faris J. Wasilewski P.
Laboratory Studies of Very Small Iron Grains: Magnetically Enhanced Coagulation

Peak D. Kusiak S. J. Donn B.
Laboratory Study of Analogs of Early Solar Nebula Condensed Objects

Tonks W. B. Melosh H. J.
Magma Ocean Formation due to Giant Impacts: The Effect of the Planet's Thermal State Before the Collision

Verronen M. Vanhala H.*
Collisional Model for Turbulent and Molecular Processes in Preplanetary Disk

Weidenschilling S. J. Davis D. R.
Multizone Simulations of Planetary Accretion: Effects of Distant Perturbations
ACHONDRITES AND IRONS

Treiman A. H.

The Parent Magma of the Nakhla (SNC) Meteorite: Constraints from Magmatic Inclusions in Olivine

Longhi J.

Volatile in SNC Petrogenesis: A Sr Signal?

Pun A. Keil K. Taylor G. J. Wieler R. King E. A.

Clasts in Kapoeta: Implications for the Regolith Evolution of the HED Parent Body

Buchanan P. C. Reid A. M.

Matrix Pyroxenes in Howardites and Polymict Eucrites

Saiki K. Yamaguchi A. Takeda H.

New Chemical Mapping Technique for Analysis of Pyroxenes in Polymict Breccias and Application to Some Eucrites

Golden D. C. Ming D. W. Zolensky M. E.

Chemistry and Mineralogy of Oxidation Products from a Nickel-rich Ataxite

Hall T. M. Burns R. G.*

Fusion Crusts of Achondrites: Changes of Mineralogy of Iron in Outernost Surfaces of Meteorites

Ntaflos Th. Koeberl C.

Petrological Studies and Bulk Chemical Analyses of Eight Antarctic Aubrites

Takeda H. Baba T. Mori H. Saito J.

Mineralogy of a New Orthopyroxene-Bearing Ureilite LEW88201 and the Relationship Between Magnesian Ureilies and Lodranites


The Divnne Achondrite - VI. New Data on Bulk Chemistry

CHONDRULES AND INCLUSIONS

Russell S. S. Pillinger C. T.

Modelling Nitrogen Degassing in Chondrite Diamonds


Isotopic Composition of Carbon and Nitrogen in the Diamonds from the Unequilibrated Ordinary Chondrite Krymka LL3.0

Krot A. Ivanova M. A.

Cr-rich Chondrules and Inclusions in Ordinary Chondrites

Keller L. P.

Petrography and Mineral Chemistry of Calcium- and Aluminum-rich Inclusions in the Maralinga CK4 Chondrite

Jones R. H.

Classification of Porphyritic, Pyroxene-rich Chondrules in the Semarkona Ordinary Chondrite

Ruzicka A. Boynton W. V.

Microfaulting of CAI Rim Layers and Relationships to the Fabric of the Leoville (CV3) Chondrite
CHONDrites AND METEORITE RECOVERY

Bischoff A. Sears D. W. G. Benoit P. H. Geiger T. Stöffler D.

New Type 3 Ordinary Chondrites from the Sahara Desert

Kallemeyn G. W.

Three Ungrouped Carbonaceous Chondrites from MacAlpine Hills, Antarctica

Prinz M. Weisberg M. K.

Acfer 182/207: A New ALH85085-Type Chondrite and its Implications

Lipschutz M. E. Wolf S. F. Gartenhaus S. Lindstrom M. M. Mittlefehldt D. W. Zolensky M. E. Wacker J. F.

Benoit P. H. Sears D. W. G. Dodd R. T.

Noblesville Meteorite Breccia: Recovery and Initial Characterization

McCoy T. J. Keil K. Bogard D. Casanova I. Lindstrom M. M.

IIafegh 009: A New Sample of the Diverse Suite of Enstatite Impact Melt Rocks

Reid A. M. Jakeš P. Zolensky M. E. Miller R.

Three New Chondrites from Western Namibia

Mardon A. A. Williams J. S.

Potential Meteorite Recovery Locales Within Russian Antarctic Logistical Capability

THE MOON COMES TO YOU!

Kadel S. D. Greeley R.

Mare Basalts in the Orientale Basin: Galileo Multispectral Observations

Mustard J. F. Head J. W. Murchie S. M. Pieters C. M. Belton M. S. McEwen A. S.

Schickard Cryptomare: Interaction Between Orientale Ejecta and Pre-Basin Mare from Spectral Mixture Analysis of Galileo SSI Data

McEwen A. S. Gaddis L. R. Neukum G. Hoffmann H. Pieters C. M. Head J. W. III

Lunar Craters and Soils: Ages, Colors, and Regolith Thicknesses

Tompkins S. Pieters C. M. Mustard J. F. Pinet P.

Distribution of Materials Excavated by the Lunar Crater Bullialdus: A Spectral Mixing Analysis


The Moon: Mid-Infrared (7.5-11.4 µm) Spectroscopy of Five Selected Regions

Wilson T. L.

The Moon as a Scientific Laboratory

Coombs C. R. Hawke B. R. Robinson M. S.

Pyroclastic Deposits on the Northwestern Limb of the Moon

Clark P. Joerg S.

Using Geochemical Profiles of Recent Impact Features in Northeastern Tranquillitatis to Characterize Mare/Highland Interfaces

Pinet P. C. Chevrel S. Shevchenko V. V.

High Resolution UV-Visible-Near Infrared Spectro-Imaging Data of Reiner Gamma Formation

Sears W. D.

Tidal Dissipation and the Giant Impact Origin for the Moon
Jaumann, R. Gröbner, C. DummeI, A. Rehban, H. Neukum, G.
Dependence of Color Ratios on the Observation Geometry

Haines, E. L. Metzger, A. E. Drake, D. M.
Water Detection at the Moon and Mars with a Combined Neutron-Gamma Ray Instrument

Stacy, N. J. S. Campbell, D. B. Ford, P. G.
High Resolution Lunar Radar Studies - Preliminary Results

Mardon, A. A.
Space Gophers: Robotic Mining Systems in Inner Solar System Exploration

High Spatial Resolution Mapping of Lunar Mare Titanium Abundances

Taylor, L. A. McKay, D. S.
An Ilmenite Feedstock on the Moon: Beneficiation of Rocks Versus Soil

Stern, S. A.
Imaging Detection of Atmospheric Sodium over the Lunar Terminator

Systematic Variations in Solar Wind Fluence with Lunar Location: Implications for Abundances of Solar-Wind-Implanted Volatiles

Premo, W. R. Tatsumoto, M.
Acid Leaching of Apatite: Implications for U-Th-Pb Systematics of Lunar Highland Plutonic Rocks

The Recognition of Monomict and Polymict Clasts from Apollo 17 Breccias

Schwarz, C.
Preliminary Description of 60013, Bottom Half of Double Drive Tube 60014/60013

Housley, R. M.
XPS Studies of the Surface Chemistry of Lunar Highlands Regolith

Finnila, A. B. Hess, P. C. Rutherford, M. J.
Dissolution of Anorthite in Lunar Maria Basalts: Preliminary Experiments and Petrologic Significance

Pearce, T. H. Timms, C.
Interference Imaging of Plagioclase in Lunar Materials

Jull, A. J. T. Donahue, D. J.
$^{14}$C Terrestrial Ages of Two Lunar Meteorites, ALHA 81005 and EET 87521

INSTRUMENTS AND FUTURE PLANETARY EXPLORATION

Kieffer, H. H. Wildey, R. L.
Spectrophotometry of the Moon for Calibration of Space-Borne Imaging Instruments

Blake, D. F. Bryson, C. Freund, F.
Design of an X-Ray Diffraction/X-Ray Fluorescence Instrument for Planetary Applications

Mancinelli, R. L. Banin, A. White, M. R.
DTA/GC: Limits of Detectability and Identification of Minerals
Can Secondary Ion Mass Spectrometry Resolve Variations in Lunar Surface Composition?

Simulation Experiments for Planetary Gamma-Ray Spectroscopy by Means of Thick Target High-Energy Proton Irradiations

Development of a Backscatter Mössbauer Spectrometer (BaMS) for Planetary Applications

Mössbauer Spectrometer for Mineralogical Analysis of the Mars Surface for the Mars-96 Mission

Seasonal Cap Measurements at Mars via Gamma Ray Spectroscopy

Experimental Simulations of Martian Neutron Spectra

Mars Rover Mission: The French Views

Science Rationale for a Discovery Program Venus Atmospheric Probe Mission

Computer Games Geologists Play: A Tool for Determining Appropriate Rover Autonomy

Spacetime Geodesy by Neural Networks

Thermal Analyzer for Planetary Soils (TAPS) Experiment, 2: Water Sensors

DYNAMICS OF IMPACT AND RESURFACING ON VENUS

Impactor Signatures on Venus

Elliptical Impact Craters on Venus

Surface Effects of Impacts into Venus’ Atmosphere

Atmospheric Effect on Cratering on Venus

Near Surface Soil-Gas Flow Due to Impact on Venus
Zahnle K. J.
Airburst Origin of Dark Shadows on Venus

Magellan Observations of Extended Impact Crater Related Deposits on the Surface of Venus

Bills B. G.*
Venus: Satellite Orbital Decay and Consequent Crater Production

Bullock M. A.* Grinspoon D. H. Head J. W.
Modeling the Volcanic Resurfacing of Venus

Global Resurfacing of Venus

Izenberg N. R.* Arvidson R. E. Phillips R. J.
Resurfacing Processes on Venus: Approaching a Global View

Simpson R. A.* Tyler G. L. Maurer M. J. Holmann E.
Scattering Properties of Venus’ Surface

Wind-Related Features on Venus Observed via Magellan

Wednesday, March 18, 1992
NEBULAR PROCESSES AND CAIS
8:30 a.m. Room B

Chairmen: J. T. Armstrong
G. W. Lugmair

Harper C. L. Jr.* Wiesmann H.
High Precision Investigations of the $^{53}$Mn-$^{53}$Cr Systematics. I. Bulk Carbonaceous Chondrites, Planetary Reservoirs and the Moon

Lugmair G. W.* MacIsaac C. Shukolyukov A.
The $^{53}$Mn-$^{53}$Cr Isotope System and Early Planetary Evolution

Shukolyukov A.* Lugmair G. W.
First Evidence for Live $^{60}$Fe in the Early Solar System

Widespread Alien Xe and its Formation

Ash R. D.* Pillinger C. T.
Carbon and Nitrogen Isotopes in CR Chondrites; Evidence for a Single Parent Body?

Thiemens M. H.*
Mass Independent Isotope Effects: Recent Advances and Application to the Pre-Solar Nebula and Stratosphere

Chen J. H.* Wasserburg G. J. Papanastassiou D. A.
Th and U in Some Chondrites

Jurewicz S. R.* Jones J. H.
Experimental Partitioning of Zirconium, Titanium, and Niobium Between Silicate Liquid and Platinum Metal
Chairmen:  B. R. Hawke  
A. S. McEwen

Head J. W.*  
Problems in Lunar Science: Galileo Results and the Promise of Future Exploration

Pieters C. M.*  Belton M.  Fischer E.  Greeley R.  Jaumann R.  Head J. W.  Hoffmann H.  McEwen A.  Murchie S.  Neukum G.  Sunshine J.  
Compositional Implications of SSI Multispectral Images of the Unexplored Lunar Farside

Hawke B. R.*  Lucey P. G.  Taylor G. J.  Peterson C. A.  Spudis P. D.  
The Distribution and Modes of Occurrence of Lunar Anorthosite

Spudis P. D.*  Hawke B. R.  Lucey P. G.  Taylor G. J.  Peterson C.  
Geology and Deposits of the Humorum Basin

Murchie S. L.*  Head J. W.  McEwen A. S.  Mustard J. F.  Pieters C. M.  Belton M. S.  
Spectral Properties of Orientale Basin Materials from Galileo Images

Sunshine J. M.*  Pieters C. M.  Head J. W.  McEwen A. S.  Greeley R.  
Oceanus Procellarum as Viewed by Galileo: Evidence for Compositional Diversity in the Mare Deposits and at the Marius Hills Plateau

Williams D. A.*  Greeley R.  
Lunar Farside Mare Deposits: Latest Galileo Imaging Results

Hiesinger H.*  Hoffmann H.  Jaumann R.  Rebban R.  Neukum G.  
Earth-Based Multispectral Observations of Mare Humorum and Western Oceanus Procellarum: Geological and Geochemical Implications

Spectral Reflectance Studies of the Grimaldi Region of the Moon

A Near-IR Spectral Investigation of the Schiller-Schickard Region of the Moon
Fischer E. M.* Pieters C. M. McEwen A. S. Head J. W. Belton M. J. S.
Lunar Highland Soil Heterogeneity: Al/Si Estimated for the Limb and Farside from Galileo SSI and Apollo X-Ray Spectrometer Data

Pinet P. C.* Chevrel S. Martin P.
Detailed Spectro-Mixing Analysis of Copernicus Crater from High Resolution Visible-Near Infrared Imaging Data

Robinson M. S.* Lucey P. G. Hawke B. R. Smith G. A.
Mariner 10 Color Images of the Eastern Limb and Farside of the Moon

Wednesday, March 18, 1992
MARTIAN SPECTRAL AND LABORATORY DATA
8:30 a.m. Room D

Chairmen: P. E. Geissler
I. P. Wright

Mustard J. F.* Erard S. Bibring J.-P. Langevin Y. Head J. W. Pieters C. M.
Pyroxene Chemistry of the Syrtis Major Volcanic Plateau

Geissler P. E.* Singer R. B.
Spectrophotometric Mapping of Coprates Quadrangle, Mars

Robinson M. S.* Zimbelman J. R.
Viking IRTF Analysis of Apollinaris Patera, Mars

Thermal Infrared Spectra (5.5-9.2 µm) of Mars Obtained from the Kuiper Airborne Observatory

Edgett K. S.* Christensen P. R.
The Windblown Sands of Mars: Estimation of the Amount of Sand in Dark Intracrater Deposits

Bishop J. L.* Pieters C. M.
Strength of IR Hydration Bands: Application to the Martian Surface

Blaney D. L.*
Does Adsorbed Carbon Dioxide Contribute to the Infrared Spectrum of Mars?

Zent A. P.* Roush T. L.
The Spectra of Chemisorbed CO2 on Mars Analog Materials

Madsen M. B.* Olsen M. Knudsen J. M. Petersen D. Vistisen L.
The Ferrimagnetic Phase in Nakhla and Zagami - Implications for the Martian Fines

Wright I. P.* Pillinger C. T. Grady M. M.
An Investigation of the Carbon in Different Lithologies of Zagami

Isotopic Studies Relevant to the Origin of the "White Druse" Carbonates on EETA 79001

Spargur C. S. Gooding J. L.*
Calorimetric "Weatherometer" for Stony Meteorites

Plumb R. C.* Scala A. A. Tantayanon R.
False-Positive Responses in "Getter" Simulations of Viking LR Results: Invalidation of that Evidence for Acidic Clay Minerals on Mars

40 • LPIB No. 62
Chairmen: N. T. Bridges  
R. W. Wichman

Kiefer W. S.*  
Convective Uplift and the Formation of the Tharsis and Elysium Regions of Mars

Golombek M. P.*  Banerdt W. B.  Franklin B. J.  
Limits on the Expansion and Contraction of the Moon

Watters T. R.*  
A Globally Distributed Compressional Ridge System on Mars?

Schultz R. A.*  Zuber M. T.  
Why are Strike-Slip Faults that are "Predicted" by Lithospheric Deformation Models Rarely Observed on Planetary Surfaces?

McGovern P. J.*  Solomon S. C.  
State of Stress and Tectonics of Large Volcanoes on Mars and Earth

Wichman R. W.*  Schultz P. H.  
Distribution of Lithospheric Failure and Volcanism in the Lunar Crisium Basin: Additional Signatures of an Oblique Multi-Ring Impact Structure

Cooper B. L.*  
Apollo 17 Lunar Sounder: Evidence for Graben Structure in the Procellarum Basin?

Bridges N. T.*  Fink J. H.  
Aspect Ratios of Lava Domes on the Earth, Moon and Venus

Bruno B. C.*  Taylor G. J.  Rowland S. K.  Lucey P. G.  Self S.  

Baloga S. M.*  Taylor G. J.  Bruno B. C.  
The Character of Lava Flow Margins

Crisp J.*  Baloga S.  
The Influence of Crystallization and Entrainment on the Emplacement of Lava Flows

Mouginis-Mark P. J.*  
Emplacement of Long Lava Flows at Elysium Mons, Mars

Zimbelman J. R.*  
Late-Stage Effusion and Mass-Wasting on Ascraeus Mons Volcano, Mars
EDUCATIONAL OUTREACH AND CAREER OPPORTUNITIES
1:30 p.m. Room B

Chairmen: N. G. Barlow
L. A. Lebosky

Invited 15 Minute Presentations:

Schultz P. H.*
The Subliminal Side of Science

Lebofsky L. A.* Lebofsky N. R.
Teaching Planetary Science in Elementary Schools

Strom R. G.* Greenberg R. J. Magisos M. Kolvoord R. E. Croft S.
Image Processing for Teaching and the Center for Image Processing in Education

Lockwood J.* Strom R. G. Greenberg R. J. Magisos M. Kolvoord R. E. Croft S.
Image Processing for Teaching: a High School Teacher's Perspective:

Mouginis-Mark P. J.* Taylor G. J. Hawke B. R.
Exciting the Community about Planetary Sciences - Experiences of the Hawaii Space Grant College Program

Dasch E. J.*
Rocks and Stars; the 77% Solution

Barlow N. G.*
Dispelling the Reservations many Young Women have about Science

Barnes C.*
Academic Opportunities for Planetary Scientists

ANTARCTIC MICROMETEORITES AND LDEF
1:30 p.m. Room C

Chairmen: D. E. Brownlee
H. A. Zook

Maurette M. Immel G. Perreau M. Pouchet M. Vincent C. Kurat G.*
The 1991 Euromet Collection of Micrometeorites at Cap-Prudhomme, Antarctica: Discussion of Possible Collection Biases

Maurette M. Brownlee D. E.* Joswiak D. J. Sutton S. R.
Antarctic Micrometeorites Smaller than 50 µm

Koeberl C.* Kurat G. Presser T. Brandstätter F. Maurette M.
Bulk Major and Trace Element Analyses of Unmelted Micrometeorites from Cap Prudhomme, Antarctica

Sutton S. R.* Prinz M. Maurette M. Nehru C. E. Weisberg M. K. Bajt S.
Antarctic Micrometeorites: Trace Element Contents and Textures of 50 to 100 µm Particles

Alexander C. M. O'D.* Maurette M. Swan P. Walker R. M.
Studies of Antarctic Micrometeorites

10Be and 26Al in Individual Cosmic Spherules from Antarctica

Klöck W.* Beckerling W. Spettel B. Flynn G. Sutton S.

Bulk Composition and Mineralogy of Antarctic Micrometeorites


Continued Investigation of the Impact Flux on the Long Duration Exposure Facility by the Meteoroid and Debris Special Investigation Group

McDonnell J. A. M.*

LDEF's Space Exposure Yields Hypervelocity Impact Penetration Relationships


Environment Modelling in Near-Earth Space: Preliminary LDEF Results

Bernhard R.* Hörz F.

Compositional Variety of Particles Encountered by LDEF's Trailing Edge


SIMS Chemical Analysis of Extended Impacts on the Leading and Trailing Edges of LDEF Experiment A0187-2

Stephan T.* Stadermann F. J. Cramer H.-G. Zehnpfenning J.

TOF-SIMS Analysis of LDEF Impact Residues

Wednesday, March 18, 1992

SOLAR WIND AND COSMIC RAY IRRADIATION

1:30 p.m. Room D

Chairmen: K. Marti
L. Schultz

Wieler R.* Bauer H. Signer P.

Krypton and Xenon from Solar Energetic Particles in a Lunar Ilmenite

Pedroni A.* Begemann F. Weber H. W.

Solar Noble Gases in Mineral Separates of ACFER 111

Rider P. E.* Becker R. H. Pepin R. O.

Measurement of Solar Wind Noble Gas Composition in Lunar Soils by In Vacuo Acid Etching

Kim Y. Kim J. S. Marti K. Kerridge J. F.*

On the Isotopic Signature of Recent Solar-Wind Nitrogen

Reedy R. C.*

Solar-Proton Production of Neon and Argon


Cross Section Measurements for the Production of Carbon-14 and Beryllium-10: Improved Estimates for Cosmogenic Nuclide Production Rates

Fink D. Klein J.* Dezfouly-Arjomandy B. Middleton R. Herzog G. F. Albrecht A.

41Ca in the Norton County Aubrite

Michlovich E.* Lipschutz M. Shortreed M. Vogt S. Elmore D.

Cosmogenic Nuclide Depth Profiles in the Iron Meteorite, Canyon Diablo
Vogt S. • Herzog G. F. • Fink D. • Klein J. • Middleton R.
Cosmogenic Nuclides in the H3 Chondrite Dhajala

Traub-Metlay S. G. • Benoit P. H.
The Natural Thermoluminescence of Meteorites with High $^{26}$-Al Contents: Unusual Orbital Histories in Ordinary Chondrites?

Eugster O. • Michel Th. • Niedermann S. • Wang D. • Yi W.
History of 27 Chinese and 10 Other Chondrites Derived from Solar, Cosmic-Ray Produced, Radiogenic and Fissiogenic Noble Gases

Nishiizumi K. • Arnold J. R. • Caffee M. W. • Finkel R. C. • Southon J.
Exposure History of Separated Phases from the Kapoeta Meteorite

Schultz L. • Weber H. W.
Noble Gases in Metal and Silicates of the IIIE Iron Meteorite Watson

Thursday, March 19, 1992
MARS SURFACE AND ATMOSPHERE THROUGH TIME:
SURFACE PROPERTIES AND PROCESSES
8:30 a.m. Room A

Chairmen: R. G. Burns
R. B. Singer

Singer R. B. • McSween H. Y. Jr.
Composition of the Martian Crust: Evidence from Spectroscopy and SNC Meteorites

Murchie S. • Erard S. • Bishop J. • Mustard J. • Bibring J.-P. • Langevin Y. • Head J. • Pieters C.
The Forms and Evolution of Water in Martian Soil: Evidence from ISM Imaging Spectroscopy

Banin A.
Analog Studies of Nanophase Iron Oxides in Mars Soil

Bell J. F. III • Morris R. V. • Adams J. B.
Relative Abundances of Poorly- and Well-Crystalline Ferric Oxides in the Martian Soil and Dust from Telescopic Data and Terrestrial Spectral Analog Studies

Burns R. G.
Chemical Weathering on Mars: Rates of Dissolution and Oxidation of Ferromagnesian Silicate Minerals

Carr M. H.
Post-Noachian Erosion Rates: Implications for Mars Climate Change

Frey H.
Thermal History and Climatic Implications of Early Hesperian Ages for Presumed Noachian Age Volcanic Flows on Mars

Rotto S. L. • Tanaka K. L.
Chryse Planitia Region, Mars: A Summary of Geologic/Geomorphologic Mapping Results

De Hon R. A. • Pani E. A.
Duration and Rates of Discharge Through a Martian Outflow System: Maja Valles

Mellon M. T. • Jakosky B. M.
Stability and Diffusion Time Scales of Water Ice in the Martian Regolith
Cave J. A.*
Martian Volcanoes and Ground-Ice: Evidence for the Localised Enrichment of Sub-Surface Ice by Juvenile Volatiles

Gulick V. C.* Baker V. R.
Martian Hydrothermal Systems: Some Physical Considerations

Thursday, March 19, 1992
COSMIC DUST AND COMETS
8:30 a.m. Room B

Chairmen:
J. P. Bradley
L. P. Keller

Flynn G. J.* Sutton S. R.
Element Abundances in Stratospheric Cosmic Dust: Indications for a New Chemical Type of Chondritic Material

Lindstrom D. J.*
Scandium/Iron and Cobalt/Iron Ratios as Indicators of the Sources of Stratospheric Dust Particles

Fomenkova M.* Chang S. Mukhlo L.
Classification of Carbonaceous Component in Comet Halley "CHON" Particles

Thomas K. L.* Keller L. P. Blanford G. Klöck W. McKay D. S.
Carbon in Anhydrous Interplanetary Dust Particles: Correlations with Silicate Mineralogy and Sources of Anhydrous IDPS

Bradley J. P.* Humecki H. J. Germani M. S.
Interplanetary Dust Analogues for Infrared Silicate Emission from Comets

Keller L. P.* Thomas K. L. McKay D. S.
Thermal Processing of Cosmic Dust: Atmospheric Heating and Parent Body Metamorphism

Zinc Depletions and Atmospheric Entry Heating in Stratospheric Cosmic Dust Particles

Nier A. O.* Schlutter D. J.
Helium Release from Interplanetary Dust Particles in Laboratory Studies Simulating the Heat Pulse Experienced by Particles During Atmospheric Entry

Herzog G. F.* Hall G. S. Brownlee D. E.
Mass Fractionation of Nickel Isotopes in Metallic Cosmic Spherules Collected from Deep-Sea Sediments

Blake D. F. Fleming R. H.*
Sequential Analyses of IDPs by LVSEM, TOF-SIMS, SIMS, and AEM

Rietmeijer F. J. M.*
Interplanetary Dust Particle L2005T12 Directly Linked to Type CM Chondrite Petrogenesis

Thiel K.* Grün E. Gebhard J. Kölzer G.
Artificial "Regolith" of an Ice-Dust Body Under Space Conditions: Dust Mantle Dynamics and Phenomenology During KOSI 9

Bistable Activity of a Cometary Analogous Ice-Mineral Mixture During Insolation
Chairmen:  C. J. Capobianco  
             H. E. Newsom

Grove T. L.*  Ehlers K. E.  Jerinicovic M. J.  Zervas D. A.
  Effect of Oxygen Fugacity on Partitioning of Ni and Co Between Olivine and Silicate Melt: Implications for Eucrite Parent Body Evolution

Amelin A. A.  Capobianco C. J.*
  The Partitioning of Co and Ni in a Simple Metal/Silicate System as a Function of Oxygen Fugacity and Temperature

McFarlane E. A.*  Drake M. J.  Rubie D. C.  Gasparik T.
  Mantle Mineral/Silicate Melt Partition Coefficients

Matsuda J.  Sudo M.  Ozima M.*
  Noble Gas Partition Between Metal and Silicate Under High Pressure

Jakeš P.*  Sen S.  Matsuishi K.  Reid A. M.  King E. A.  Casanova I.
  Silicate Melts at Super Liquidus Temperatures: Reduction and Volatilization

Hillgren V. J.*  Capobianco C. J.  Drake M. J.
  Metal-Silicate Partitioning Behavior of Moderately Siderophile Elements in Ni-Rich Systems

Newsom H. E.*  Noll P. D. Jr.  Slane F. A.  Beserra T. B.
  Siderophile Element Abundances and Behavior

  The Origin of Highly Siderophile Elements in the Upper Mantle of the Earth: An Experimental Approach

Dickinson T. L.  Lofgren G. E.  Casanova I.*
  High Temperature Reduction of Silicon in Enstatite Meteorites: Evidence from the Experimental Studies of Indarch

Shaffer E. E.*  Burnett D. S.
  Minor Element Variations in Plagioclase

Smyth J. R.*  McCormick T. C.
  Hydrous Silicates in the Upper Mantles of Terrestrial Planets

Ross D. K.*  Elthon D.
  Variable Size of the Crystallizing Boundary Layer During Formation of the Stillwater Layered Complex, Montana

Tatsumoto M.*  Nakamura Y.  Premo W. R.  Boyd F. R.
  Elemental Distribution of U, Th, and Pb in Peridotite Xenoliths: Implications for the Pb Isotopic Evolution of the Moon

Chairmen:  G. J. Flynn  
             A. P. Zent

Jakosky B. M.*
  Out on a Limb: Mars Atmospheric Opacity During the Last Hundred Years
Global Behavior of Martian Atmospheric Dust During the Viking Era

The Contribution of Meteoritic Material to the Dust and Aerosols in the Atmosphere of Mars

Hazes and Clouds on Mars: Some of the Phobos Mission Results

Polarimetric Survey of Crystal Clouds on Mars

Coupled Subsurface Atmosphere Boundary Layer Model of H2O on Mars: Sensitivity Studies

Volatile on Mars: The Role of SO2

Martian Surface Texture and Wind Effect Implications

Geologic Effects of Atmosphere Loss on Mars: Evidence from Highland Erosion

Quantifying Crater Degradation in Maja Valles and Memnonia, Mars

Morphologic Variations of Degraded Impact Craters in the Martian Highlands

Simulated Erosion of Martian Heavily Cratered Terrain

Thursday, March 19, 1992
STARDUST
1:30 p.m. Room B

Chairmen: G. R. Huss
U. Ott

Huss G. R.* Hutcheon I. D. Wasserburg G. J. Stone J.
Presolar (?) Corundum in the Orgueil Meteorite

Newton J.* Arden J. W. Pillinger C. T.
Carbon and Nitrogen Isotope Studies of a Suite of Type CO3 Carbonaceous Chondrites

Russell S. S. Arden J. W.* Pillinger C. T.
Adrar 003: An Unequilibrated Ordinary Chondrite Rich in Pristine Interstellar Grains

Hoppe P.* Amari S. Zinner E. Lewis R. S.
Just How Many Types of Interstellar Carbon?

Amari S.* Hoppe P. Zinner E. Lewis R. S.
Interstellar SiC with Unusual Isotopic Compositions
Verchovsky A. B. • Ott U. • Russell S. S. • Pillinger C. T. • Fisenko A. V. • Shukolyukov Yu. A.
"Carbon, Nitrogen and Noble Gases in Diamond-rich Residues of the Efremovka CV3 Chondrite"

Lewis R. S. * • Amari S.
"Interstellar Murchison Graphite: How Many Noble Gas Components?"

Nichols R. H. Jr. * • Hohenberg C. M. • Hoppe P. • Amari S. • Lewis R. S.
"$^{22}$Ne-E(H) and $^4$He in Single SiC and $^{22}$Ne-E(L) in Single Ca Known C-Isotopic Compositions"

Richter S. • Ott U. * • Begemann F.
"S-process Isotope Anomalies: Neodymium, Samarium, and a Bit More of Strontium"

Prombo C. A. * • Podosek F. A. • Amari S. • Lewis R. S.
"S-Process Sr and Ba in SiC from Murchison Series KJ"

Alexander C. M. O'D. • Swan P. D. • Walker R. M. *
"Continued In Situ Studies of Interstellar Grains in Primitive Meteorites"

Bernatowicz T. J. * • Amari S. • Lewis R. S.
"TEM Studies of a Circumstellar Rock"

Clayton D. D. * • Brown L. E.
"New Ideas for SiC: Mg Burning in AGB Shell Flashes"

Thursday, March 19, 1992
TERRESTRIAL IMPACTS AND THE K/T BOUNDARY
1:30 p.m. • Room C

Chairmen: A. R. Hildebrand
E. M. Shoemaker

Shoemaker E. M. * • Izett G. A.
"Stratigraphic Evidence from Western North America for Multiple Impacts at the K/T Boundary"

Hartung J. * • Kracher A. • Anderson R. • Plocher O.
"Manson Impact Structure Rocks: Evidence for an Exotic Component"

Anderson R. R. * • Hartung J. B. • Reagan M. K. • Bell M. S. • Plocher O.
"First Results from the Manson Impact Structure Core-Drilling Project: Preliminary Observations and Interpretations from the M-1 Core"

Schultz P. H. * • Grant J. • Collins W. • Lopez J. P. • Toselli A. J. • Castellanos T. G.
"Rio Cuarto Crater Field"

Bunch T. E. * • Schultz P. H.
"A Study of the Rio Cuarto Loess Impactites and Chondritic Impactor"

Pevzner L. A. • Kirjakov A. F. • Vorontsov A. K. • Masaitis V. L. • Mashchak M. S. • Ivanov B. A. *
"Vorotilovskaya Drillhole: First Deep Drilling in the Central Uplift of Large Terrestrial Impact Crater"

Quezada Múñiz J. M. • Marín L. E. • Sharpton V. L. * • Ryder G. • Schursaytz B. C.
"The Chicxulub Impact Structure: Shock Deformation and Target Composition"

Brett R. *
"Anhydrite: A Lethal Target Rock at the Chicxulub Impact Site"
Vickery A. M.*  Kring D. A.  Melosh H. J.
Ejecta Associated with Large Terrestrial Impacts: Implications for the Chicxulub Impact and K/T Boundary Stratigraphy

Hildebrand A. R.*  Stansberry J. A.
K/T Boundary Ejecta Distribution Predicts Size and Location of Chicxulub Crater

Bohor B. F.*  Betterton W. J.
Ejection and Dispersal Mechanisms of the K/T Impact

Glass B. P.*  Wu J.
Impact Ejecta Associated with the Australasian and North America Microtekrite Layers

Thursday, March 19, 1992
POSTER SESSION II
7:00 - 9:00 p.m.  LPI

EXOBIOLOGY

Ivanov M. V.  Lein A. Yu.  Mukhin L. M.
Geochemical Evidences of Methane-Producing Bacteria's Activity in Rocks of Mars

MARS SPECTRA: OBSERVATIONAL DATA/LABORATORY ANALYSIS

Reyes D. P.

Ramsey M. S.  Christensen P. R.
The Linear "Un-Mixing" of Laboratory Thermal Infrared Spectra: Implications for the Thermal Emission Spectrometer (TES) Experiment, Mars Observer

Bishop J. L.  Pieters C. M.  Burns R. G.
Ferrihydrite Found in Fe-rich Montmorillonite and its Relationship to the Reflectance Spectra of Mars

Vaniman D. T.  Heiken G.  Wohletz K.  Blacic J.
Palagonites and Martian Soil Simulants

Head J. N.  Singer R. B.  Geissler P. E.
Multispectral Study of Cerberus Dark Materials

DeBraal J. D.  Reed M. H.  Plumlee G. S.
Preliminary Results of Computer Modeled Near 0°C Water-Rock Interactions at the Martian Surface

Merenyi E.  Miller J. S.  Singer R. B.
Compositional Variations on the Surface of Mars: Mixing Model Analysis from a Telescopic Spectral Image

Spectral Properties of Cr Substituted Goethites and Hematites

Roush T. L.  Martin T. Z.  Pollack J. B.
Analysis of Mariner 7 Thermal Infrared Spectra of Mars and Comparison to Recent Airborne Observations

Edgett K. S.  Geissler P. E.  Herkenhoff K. E.
Mars: The Composition of Dunes and Other Dark Surficial Material

Tejfel V. G.  Sinyaeva N. V.  Aksenov A. N.  Kharitonova G. A.
The Experience of the Mars Normal Albedo and Limb Darkening Coefficients Mapping from the Observations During 1990 Opposition
Miller J. S. Singer R. B. Wells W. K. Weller L.
Radiance Factor Calibration of 1988 Visible and Near-IR Spectral Images of Mars

McEwen A. S.
Temporal Variability of the Surface and Atmosphere of Mars: Viking Orbiter Color Observations

Erard S. Drossart P. Bibring J.-P. Langevin Y. Pinet P. Chevrier S.
Aerosol Contribution to the Reflectance Spectra of Mars

Roush T. L. Singer R. B.
Analysis of Mars 1986 Seasonal South Polar Cap Spectrum

GEOLOGY/GEOPHYSICS: MARS/MERCURY

Kozak R. C. Batson R. M. Isbell N. K.
Digital Geologic Maps of the Planets

Harmon J. K. Slade M. A.
Radar Mapping of Mercury

Butler B. Muhlemann D. Slade M.
A Comparison of the Radar Returns from the Icy Poles and Other Regions of Mars and Mercury

Mars Quasi-Specular Echoes: Preliminary Results at 3.5-cm Wavelength

Price K. H.
Geologic Mapping of Part of Harmakhis Vallis Region, Mars: Evidence of Multiple Drainage Events

Craddock R. A. Crumpler L. S. Aubele J. C.
Central Chryse Planitia, Mars: Geologic Unit Interpretation from 1:500,000-Scale Mapping

Chapman M. G.
Geologic Mapping of the Granicus Valles, Mars

McBride K.
Geologic Mapping of the Elysium Region of Mars

Parker T. J. Gorsline D. S.
Preliminary Geologic Mapping of the MTM -55036 and -55043 Quadrangles, Southern Argyre Planitia, Mars

Reidy A.-M. Sandford C. A. Frey H. Schultz R. A.
A Search for Large Impact Basins in the Southern Hemisphere of Mars II: South Polar B?

Strickland E. L. III
Physical Properties of Deucalionis, Eos, and Xanthe-type Units in the Central Equatorial Region of Mars

Murchie S. L. Erard S. Mustard J. F. Bibring J.-F. Langevin Y. Head J. W. Pieters C. M.
The Geology of the Interior Deposits of Valles Marineris from Viking Images and ISM Imaging Spectroscopy

Lucchitta B. K. Isbell N. K.
Valles Marineris Volumes

Comparison of Automatically Generated DEM of Tithonium Chasma with USGS Interpolated Contour DEM
Sotin C. Smrekar S. Rosenqvist Y. Bibring J.-P.
Topography of Tharsis Mons (Mars) Deduced from the ISM Experiment: Comparison with Radar Profiles

Marchenko K. I. Koshlyakov E. M. Zharkov V. N. Nikishin A. M.
Investigation of Stresses in the Lithosphere of Mars: New Tectonic Interpretation

Jöns H.-P.
Large-Scale Tectonic Features, Volcanoes, and Suspected Intrusions of the Ancient Uplands of Mars

Frey H.
New Mars Global Gravity Field: Correlation with Topography, Physiography and Large Impact Basins

Murray J. B. Rothery D. A. Thornhill G. Muller J.-P. Cook T. Day T. Iliiffe J. C.
The Origin of Grooves and Crater Chains on Phobos

Blumberg D. G. Greeley R.
Influence of Surface Roughness on Windblown Sand: Earth, Mars, and Venus

TERRESTRIAL CRATERING: FIELD STUDIES

Feldman V. I. Sazonova L. V. Korotaева N. N. Guseva L. B. Budkov G. K.
Diaplectic Transformation of Minerals in Vorotilov Core, Puchezh-Katunk Astrobleme, Russia (Preliminary Data)

Ivanov B. A. Petaev M. I.
Mass and Impact Velocity of the Meteorite Formed the Sterlitamak Crater in 1990

Reimold W. U. Koeberl C.
Pretoria Salt Pan Impact Crater: Impact Glasses and Sulphide Spherules

Koeberl C. Schultz P. H.
Chemical Composition of Meteoritic and Impactite Samples from the Rio Cuarto Craters, Argentina

Perry E. C. Winter D. J. Sagar B. Wu B.
The Chixculub Structure: Surface Manifestation and Possible Sulfur Isotope Signature

Grant J. A. Schultz P. H.
Gradation of the Rio Cuarto Crater Field, Argentina

Marín L. E. Quezada-Muñeton J. M. Sharpton V. L. Ryder G. Schuraytz B. C. Dalrymple G. B.
Age Constraints on the Chixculub Impact Structure: K/T or Not?

Pope K. O. Ocampo A. C.
Biospheric Effects of the Proposed Chixculub K/T Bolide

Halvorson K. McHone J. F.
Vredefort Coesite Confirmed with Raman Spectroscopy

Pilkington M. Grieve R. A. F.
The Geophysical Signature of Terrestrial Impact Craters

MARS: AVALANCHES

Sullivan R.
Three-Dimensional Stability Back-Analysis of Small Martian Avalanche Chutes

Lucchitta B. K. Ferguson H. M.
A Martian Landslide Caught in the Act?
MARS: ATMOSPHERE

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An Experimental Study of Partitioning between Carbonate and Silicate Liquids

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The Compositions of Planetary Cores and Mantles

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Carbon Isotopic Composition of Precambrian Sediments Extracted by Stepped Combustion

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A Geochemical Model for the Enriched Crust and Depleted Mantle of Mars

Friday, March 20, 1992

OFFERINGS FROM THE MOON

8:30 a.m. Room A

Chairmen: C. R. Coombs

B. Fegley Jr.

Hood L. L.*

Deflection of Solar Wind Ions by Lunar Magnetic Fields: Implications for Resource Utilization

Keller L. P. McKay D. S.*

Impact Glasses and Vapor Condensates in Apollo 11 Soil 10084

Fogel R. A.* Rutherford M. J.

C-O-S-Cl Volatiles in Primitive Lunar Glasses: FTIR and EM Analyses of Apollo 15 Green Glasses

Fegley B. Jr.*

Lunar Volcanic Gases: The Predicted Presence of Chlorofluorocarbon Gases

Therriault A. M.* Hörz F. Cintala M. J. Cardenas F. Haynes G. L.

Fractionation Trends During Impact Comminution of Modally Controlled Regoliths

Allen C. C. Hines J. A. Altemir D. A.* McKay D. S.

Sintering of Lunar Simulant Basalt

Antonenko I.*

Metallic Iron in Lunar Sample 79002,2030

Taylor L. A. McKay D. S. Graf J. Patchen A. Wentworth S. Oder R. Jerde E.

Magnetic Beneficiation of High-Ti Mare Basalts: Petrographic Analyses
Allen C. C.* McKay D. S. Morris R. V.
Hydrogen Reduction of Lunar Simulant Glass

Agosto W. N.*
Electrolytic Production of Lunar Iron and Oxygen at Room Temperature

Friday, March 20, 1992
"ACAPULCOITES" AND STONY-IRON METEORITES; METEORITE ORGANICS
8:30 a.m. Room B

Chairmen:
K. Keil
J. W. Morgan

Zipfel J.* Kennedy A. K. Hutcheon I. D. Spettel B. Palme H.
Thermal History of the Acapulco Meteorite

Pellas P.* Fiéni C.
244Pu Content of Phosphates and Cooling History of Acapulco Meteorite

Kim Y. Kim J. S. Marti K.*
Search for N and Xe Carriers in the Acapulco Meteorite

McCoy T. J.* Keil K. Mayeda T. K. Clayton R. N.
Monument Draw and the Formation of the Acapulcoites

Hutcheon I. D. Olsen E. Zipfel J. Wasserburg G. J.
Cr Isotopes in Differentiated Meteorites: Evidence for 53Mn

Creaser R. A.* Papanastassiou D. A. Wasserburg G. J.
Re-Os Isotope Study of Iron Meteorites Using Negative Thermal Ion Mass Spectrometry

Esat T. M.* Bennett V.
Disturbed Re-Os Isotope Systematics in IIIAB Iron Meteorites

Rhenium-Osmium Isotope Systematics in Chondrites and Iron Meteorites

Kennedy A. K.* Stewart B. W. Hutcheon I. D. Papanastassiou D. A. Wasserburg G. J.
Partitioning of REE Between Phosphates and Silicates in Mesosiderites: Evidence for Differing Degrees of Equilibration

Stewart B. W. * Papanastassiou D. A. Wasserburg G. J.
Sm-Nd Chronology and Petrochemistry of Mesosiderites

Tyburczy J. A. Tingle T. N. Ahrens T. J. * Becker C. H.
Organic Mass Spectra of Shocked Murchison Meteorite

Clemett S. J.* Maechling C. R. Zare R. N. Alexander C. M. O'D.
Analysis of Polycyclic Aromatic Hydrocarbons in Seventeen Ordinary and Carbonaceous Chondrites

Heymann D.*
Search for Fullerenes in Meteorites I: Roasting of Fullerenes in Air
Chairmen: C. R. Chapman
F. Vilas


_The Galileo SS/ Experiment at Gaspra: Overview and Expectations_


_951 Gaspra: Preliminary Albedos from Galileo Images_


_951 Gaspra: Preliminary Galileo SSI Results on Craters, Collisions, and Regolith_

Thomas P. C.* Davies M. E. Simonelli D. Veverka J. Belton M. Galileo Imaging Team

_Gaspra’s Shape and Surface Features: Comparison with Small Satellites_

Asphaug E.* Nolan M. C.

_Analytical and Numerical Predictions for Regolith Production on Asteroids_

Fanale F. P.* Clark B. E.

_BAR Plot Analysis of S Type Asteroid and Ordinary Chondrite Reflectance Spectra_

Gaffey M. J.*

_Narrowing the Search for Ordinary Chondrites Among the Large S-Type Asteroids: Identification and Tests of Three Prime Candidates_

Hiroi T.* Bell J. F. Takeda H. Pieters C. M.

_Spectral Comparison Between the S-Asteroids and Primitive Achondrites_

Britt D. T.* Lebofsky L. A.

_Spectral Variation Within Asteroid Classes_

Britt D. T. Bell J. F.* Haack H. Scott E. R. D.

_The Reflectance Spectrum of Troilite_

Granahan J. C.* Bell J. F.

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<td>New in Print</td>
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<td>6</td>
<td>LPSC 23 Preview</td>
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<tr>
<td>8</td>
<td>News from Space</td>
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<td>13</td>
<td>Late News from Chicxulub</td>
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<td>Calendar</td>
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<td>LPSC 23 Preliminary Program</td>
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**COMING ATTRACTIONS . . . See Page 6**