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lunar & planetary information bulletin

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EIGHTEENTH LPSC PLANS PROGRESSING

The *EIGHTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE* will be held at the Johnson Space Center, Houston, TX, March 16-20, 1987. Sponsors of the Conference include: Lunar and Planetary Institute, NASA-Johnson Space Center, the American Geophysical Union, the Division for Planetary Sciences of the American Astronomical Society the Geological Society of America, International Union of Geological Sciences, and the Meteoritical Society. Chairmen of the Conference are Dr. Michael Duke, JSC, and Dr. Kevin Burke, LPI.

The Lunar and Planetary Science Conference is recognized as the leading international conference for the presentation of new results in planetary science, bringing together a group of specialists in petrology, geochemistry, geophysics, geology and astronomy. Scientists in all lunar and planetary programs are invited to submit abstracts and to participate in the conference.

Welcome Social: The conference will open with registration and a social at the Lunar and Planetary Institute on Sunday evening, March 15th. Light refreshments will be served from 7:00 to 10:00 p.m. Conference participants are encouraged to come and mingle with old friends, register, and receive abstract volumes, packets and badges. The Galveston Limousine vans will provide shuttle service between LPI and the local hotels during these hours.

Abstracts: Abstracts are to be short papers that can be cited in the literature. Abstracts will be limited to two pages. For readers of the *BULLETIN* who did not receive the first announcement for the conference and wish to submit an abstract, please contact the Publications Office for abstract forms (713-486-2143). *DEADLINE FOR RECEIPT OF ABSTRACTS AT THE LPI IS **21 JANUARY 1987.*** There will be no late fees charged this year because no abstract will be accepted after 6:00 p.m. on January 21. Any abstracts arriving after 6:00 p.m. on January 21 will be returned to the author.

Abstracts of papers submitted to the conference will be published in *Lunar and Planetary Science XVIII.* Abstract volumes will be available to registrants at the Conference. Copies of the Abstracts remaining after the conference will be available for a small handling charge plus postage. Watch the February *BULLETIN* for order form and price list.

Pre-registration: Please plan to pre-register. Pre-payment is preferred, but since this is difficult for non-US participants, sending in the pre-registration form included with the second announcement of the Conference, or included in this Bulletin, without payment will still help to have your badge ready in advance. The fee for conference participation is $35 for all attendees except students with student ID's, who may register for $20.00. Pre-registration will be accepted through March 9. A receipt will be included in your packet at registration.

Program: There will be no more than three concurrent sessions during the five-day period devoted to presentations of research papers in both topical symposia and in problem-

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oriented sessions. A strict eight-minute limit will be placed on each oral presentation; an additional seven minutes per speaker will be allowed for discussion and for transition from one speaker to the next. Two topical sessions are already

LPSC ABSTRACT DEADLINE JAN. 21, 1987 6:00 PM

planned for this meeting. They are a LAPST-sponsored session on "Lunar Science and Future Exploration" and a session convened by J. Cuzzi on "The Onset of Accretion." In addition, a public session sponsored by the Planetary Society on United States and Soviet planetary exploration plans is scheduled for Monday evening. (For additional information on these topical symposia see articles elsewhere in this *Bulletin*)

Special Sessions: Some evenings will be set aside for special sessions. These sessions may be impromptu or may be devised and structured by members of the Lunar and Planetary Science community as desired. To make arrangements for special sessions, please contact Ms. Pam Jones, LPI, 713-486-2150 to reserve time and space. These sessions will not be considered part of the formal program.

Poster Sessions: Poster sessions are becoming more and more popular at the conference. An innovation planned for this year is to schedule time for poster presenters to give a two-minute outline of poster results with a single slide and no discussion. Presenters will be available at a different time to discuss their results with interested parties in the poster area. Poster presentations must be supported by informative abstracts. The program committee will employ the same criteria to govern allocation of space and time in poster sessions as for other forms of presentation.

Chili Cook-off: The *Seventh Annual LPSC Chili Cook-off/ Barbeque Dinner* will be held on Tuesday, March 17. The cook-off portion of the social will be held only if at least 15 teams enter. Forms for entering chili cook-off teams are in the second mailing for the Conference. If you do not get this mailing or need more forms or have any questions, call the Projects Office (713-486-2150). The more teams, the more fun.

Proceedings: The Proceedings of the Eighteenth LPSC will be published as a hardcover book. This is planned to be a joint venture between the LPI and a major book publisher. Graham Ryder has agreed to serve as Editor of the Proceedings. The deadline for submission of manuscripts to the 18th Proceedings is May 31, 1987. Questionnaires regarding intent to publish and guidelines for submitting will be distributed at the Conference.

The following schedule lists dates important to the submission of abstracts, to attendance at the conference, and to the submission of papers for the Proceedings

Immediately:	Request abstract forms if you do not have them
Nov. 10, 1986:	Abstract forms mailed to respondents
Jan. 21, 1987	Deadline for submission of abstracts
Mar. 16-20, 1987	Eighteenth Lunar and Planetary Science Conference
May 31, 1987	Deadline for submission of papers to the 18th Proceedings

On-line Program In addition to having the preliminary program in the February issue of this *BULLETIN*, the program will be on-line for easy access through SPAN or remote communications. See directions for accessing the on-line program elsewhere in this Bulletin.

SPECIAL MEETINGS TO BE HELD AT XVIIIth LPSC

Symposium on Lunar Science and Future Exploration

A symposium entitled "Lunar Science and Future Exploration" will focus on the Lunar Geoscience Observer (LGO) mission and its contributions to lunar science. Because of our extensive knowledge from the Apollo missions and subsequent studies of lunar samples, we are able to formulate specific questions about the Moon's origin and evolution which form a framework for future missions. The symposium will begin with an overview of the LGO mission that discusses its importance and describes the capabilities of its suggested instruments. A panel of scientists responsible for instrument design will be available to answer detailed questions on instrument capabilities. Four invited talks will focus on major unsolved problems in lunar science and suggest how results from LGO may contribute to their solution. A talk on Lunar Origins will describe models of the Moon's origin and show how new geochemical and geophysical data can constrain them. The second talk focussing on Crustal Evolution will discuss the Magma Ocean hypothesis of early lunar differentiation and models of crustal thickness and density; it will also address the later magmatic history of both highland and mare areas. The next talk on Surface Processes will discuss regolith processes, cratering mechanics and basin ejecta deposits in an attempt to evaluate compositional effects of impact processes. The final invited talk on Interior Properties will show how measurements of lunar magnetism, electrical conductivity, gravity, and heat flow will constrain models of thermal history and core formation. The remainder of the symposium is reserved for contributed talks on scientific problems which may be addressed with new data from LGO or other future lunar missions. Abstracts of contributed talks should be submitted to the 18th Lunar and Planetary Science Conference specifying **LGO symposium**.

Marilyn Lindstrom, NASA-JSC, 713-483-6241

Special Session: Onset of Accretion

A special session is planned on "The Onset of Accretion," which will focus on processes and phenomena which relate to the earliest stages in the growth of solids in the protoplanetary nebula. There will be invited talks on the subjects of nebula dynamics, theory of grain growth, gas-particle interactions, meteorite evidence for early grain properties, and chondrite

evidence concerning timescales of accretion. These talks will combine tutorial overviews with illumination of current problem areas. Contributed papers of relevance to all stages of planetary accretion are solicited, and will be incorporated into this and possibly a subsequent session depending on demand. Abstracts of contributed talks should be submitted to the 18th Lunar and Planetary Science Conference specifying **Accretion session.**

Jeff Cuzzi, NASA-Ames, 415-694-6343

LUNAR AND PLANETARY SCIENCE CONFERENCE "FORUM"

During the 15th Lunar and Planetary Science Conference, a meeting was organized by a group of participants who were concerned about the organization of the LPSC. Several issues and possible solutions were discussed during that meeting. The consensus was that steps should be taken to provide a mechanism for airing opinions, problems and needs concerning the annual conference and publications relating to it.

The group voted to initiate an annual Lunar and Planetary Science Conference *Forum,* to be held during the conference each year, where meeting participants could openly express and discuss mutual concerns. This year the forum will be held on Thursday, March 19.

Suggestions for issues to be placed before the *Forum* are hereby solicited. The questions, comments, and suggestions which you send in will be summarized and distributed to all Lunar and Planetary Science Conference attendees at registration. The summary will serve as the basis for the *Forum* agenda.

Please send all comments to the LPSC Forum, LPI Projects Office, 3303 NASA Road 1, Houston, TX 77058.

ALL YE AUTHORS, PLEASE NOTE — PUBLISHERS' EXHIBIT

The Library Information Center (LIC) at the LPI will again sponsor a *Combined Publishers' Exhibit* at the XVIIIth Conference. We do query a number of publishers to submit items for the exhibit, *BUT* if you have a new book coming out, and would like to have a copy on display, or brochures describing it, be sure to either alert your publisher to send a display copy to Fran Waranius, at the LPI, or send one yourself. If you will send it or give us information about the publication before the conference, we will be able to include the information in our catalog of the exhibit. Deadline for materials to be included in the catalog is February 28, 1987.

FLETCHER ANNOUNCES SHUTTLE MANIFEST

NASA's plan for renewed Shuttle flight operations through February 1991 is a prudent plan reflecting many competing priorities, Administrator James Fletcher said October 3. A Manifest for flights 26 through 53 has been released.

Some of the planned flights of highest interest to the science community include The Hubble Space Telescope which will be launched in 1988; Magellan, which will map Venus with a high-resolution radar, will be launched in 1989, as will ASTRO-1, a Shuttle-borne ultraviolet observatory. In 1987, specific launch assignments have been allocated to three planetary missions: Ulysses, which will study the Sun's northern polar regions for the first time; Galileo, which will make the first comprehensive survey of Jupiter and its moons; and the Mars Observer.

Flight 30	11/17/88	Atlantis	Space Telescope
Flight 31	01/19/89	Columbia	ASTRO-1
Flight 33	04/25/89	Atlantis	Magellan
Flight 39	11/01/89	Atlantis	Planetary opportunity
Flight 41	01/18/90	Columbia	Gamma Ray Observatory
Flight 49	10/05/90	Discovery	Planetary opportunity

PLANETARY SCIENCE DATA ACCESS—SUPPLEMENT

The Planetary Data Workshop was held in late 1984 at the Goddard Space Flight Center and discussed the need for easy access to existing planetary science data. The concept and requirements for the Planetary Data System (PDS) were formulated at this workshop which included on-line catalogs, electronic communications, digital optical disks for data storage and distribution, standard data nomenclature and formats, data documentation and calibrations, supporting software and higher-level data products. Also, the need for supplemental data defining observing geometry was identified as a major concern.

A developmental effort has been initiated to address this need for timely, accurate and updatable supplemental instrument viewing geometry data associated with science data sets obtained from interplanetary spacecraft. This activity involved Ed Danielson/Caltech, Chuck Acton, Steve Synnott and various Navigation Team Members/JPL, Mert Davies/RAND, Larry Soderblom and Hugh Kieffer/USGS, and Ray Arvidson/Washington University. The concept includes making basic data files and software needed to calculate any supplemental geometry parameter directly available to the science community. This is contrasted with the current method of supplying a tape (SEDR file) with the derived viewing geometry parameters. This SEDR is produced once, usually months after an encounter, and cannot be updated since it contains derived parameters and not the basic files from which the parameters were derived.

The basic data files are referred to as the *SPICE* files where: S is the spacecraft trajectory; P is the planetary, satellite, asteroid and comet ephemerides and body parameter values (e.g., spin rate, radii, prime meridian location); I is the instrument mounting

orientation angles and geometric parameters (e.g., focal length, field of view, detector size); C is the inertial pointing/orientation angles of an instrument, platform and spacecraft; and E is the actual spacecraft/instrument sequence of events including anomalies during observations. Typically, the S, P and C files are continually updated during and after a mission by navigation, radio science and cartography.

It is the S, P and C files that are currently receiving attention. The JPL navigation activity (Navigation Ancillary Information Facility - NAIF) has produced transportable S and P files including the software system to compute a variety of viewing geometry parameters which are available to the planetary community for testing. The C file has undergone extensive testing during the Voyager/Uranus encounter for imaging data and a few other platform-based instruments. An accurate C file was produced by NAIF for over 92% of all Uranus encounter imaging science data within 30 hours of ground receipt of the imaging data. A registration procedure was employed to measure the image location of limbs, terminators, stars, rings and surface features to calculate camera pointing to an accuracy of a few pixels.

Additional development is needed to interpolate and extrapolate the accurate camera pointing information to the other science instruments. In addition to the Uranus experiments, U.S. Geological Survey at Flagstaff has been refining the techniques of improving the accuracy of the C file by interpolation (referred as as "C Smithing") for a Voyager data set of the Galilean satellites. Also, the detailed content and format standards of the I and E files remain to be developed.

Current SPICE files exist for Voyager (Jupiter, Saturn, Uranus and Neptune) and Galileo (the software and files can also be used for observation planning.) Anyone interested in the existing NAIF/SPICE files and software for use, testing and evaluation can contact Chuck Acton at 818-354-3869 (FTS 792-3869, CActon on Telemail or send mail to CHICO::CHA on SPAN.

T. Duxbury, JPL

Opportunities for Student Research in the Space Sciences

Several different programs provide opportunities to undergraduate students who are interested in the space sciences as a career opportunity. Among these are the LPI Summer Intern Program, the NASA Planetary Geology and Geophysics Undergraduate Research Program and the Goddard Scholarship awarded by the National Space Club.

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LPI SUMMER INTERN PROGRAM

The Lunar and Planetary Institute offers selected undergraduates an opportunity to participate actively in lunar and planetary research with scientists at the Institute and at the NASA Johnson Space Center. The ten-week program begins in mid-June and ends in mid-August although some adjustment is possible to fit individual schedules.

Eligibility and selection criteria

Undergraduates, including class of 1987 graduates, are eligible and will be considered for appointment without regard for race, creed, color, sex, national origin, age, handicap status or other non-merit factor. Selection is based upon the following criteria: (1) scholarship, curriculum and experience, (2) career objectives and scientific interests, and (3) match of interests of applicant with available research projects.

Potential areas of research

Cosmic dust characterization, meteorites and their origins, properties of planetary regolith, chemistry of Martian soil analogs, planetary volcanism, geophysical data analysis and modeling, geochemistry, petrology, experimental petrology, processing of remote sensing data and images, photogeology, tectonics and tectonic processes, planetary impact cratering, spectroscopic observations of planetary surfaces, and planning future lunar and planetary exploration. Each project will be directed by an LPI or JSC scientist.

Application deadline is March 16, 1987

Application forms should be requested from Ms. Pam Jones at the LPI. The applicant will be asked to include a brief biographical sketch, a description of academic goals, career plans and scientific interests, and a summary of why you wish to participate in the intern program. In addition, applicants should arrange for official transcripts and three letters of recommendation covering academic achievement, career potential and character. Application forms will be sent to all requestors in mid-January. Notification of selection will be made by April 20, 1987.

Requests for application forms should be directed to:

SUMMER INTERN PROGRAM
The Lunar and Planetary Institute
3303 Nasa Road 1
Houston, TX 77058-4399

Questions concerning the program should be directed to Ms. Pam Jones, (713)486-2150.

THE DR. ROBERT H. GODDARD SCHOLARSHIP

The National Space Club will award a $7,500 scholarship for the academic year 1987-88. The scholarship is in memory of Dr. Robert H. Goddard, America's rocket pioneer. The award is given to stimulate the interest of talented students in the

opportunity to advance scientific knowledge through space research and exploration. The 1987 award winner will be introduced to the nation's leaders in science, government and industry at the Goddard Memorial Dinner to be held March 20, 1987. The National Space Club will pay travel and lodging costs so that the winner will be able to attend the dinner.

The terms of the scholarship are as follows:

1. The applicant must be a U.S. citizen, in at least the junior year of an accredited university, and have the intention of pursuing undergraduate or graduate studies in science or engineering during the interval of the scholarship.

2. The selection for the award is made by the NSC Committee on Scholarships on the basis of the following:

a. Official transcript of college record

b. Letters of recommendation from faculty

c. Accomplishments demonstrating personal qualities of creativity and leadership

d. Scholastic plans that would lead to future participation in some phase of the aerospace sciences and technology

e. Proven past research and participation in space related science and engineering

f. Personal need is considered but is not controlling.

3. Applicants should apply by letter and provide the necessary data requested in a,b,c,d,e and f above no later than January 16, 1987, to:

National Space Club/Goddard Scholarship
655 15th Street, N.W., Suite 300
Washington DC 20005

4. Upon completion of his work, the winner may be asked to prepare a brief report on a topic of his selection to be presented to the National Space Club.

5. The successful applicant for the scholarship will be notified on or before March 1, 1987. Unsuccessful applicants will not be individually notified.

Funds awarded are paid to the winner through his university before the new academic year begins. The winner is eligible to compete for a second year if the circumstances and his accomplishments are warranted.

Chairman of the Scholarship Committee is Mr. Stephen E. Dwornik.

NASA PLANETARY GEOLOGY AND GEOPHYSICS UNDERGRADUATE RESEARCH PROGRAM

The PGGUR Program provides undergraduate students with an excellent opportunity early in their careers to think about and consider planetary work. Students chosen to participate in the program will work with a NASA sponsored research investigator for six to eight weeks during the summer months (June, July, August). Typical tasks in which undergraduate researchers may become involved include volcanic modeling experiments, wind tunnel projects, impact crater morphological studies, data processing, organizing and interpreting data for topical studies and photogeological studies of the Moon, Mars and Mercury, and the outer planets.

Eligibility

Students who are undergraduates above freshman level, majoring in geology or related sciences and have not been previously selected are eligible for this program. This includes class of 1987 graduates. Applicants will be considered for appointment without regard to race, creed, color, sex, national origin, age, handicap status, or any other non-merit factor.

Application

Interested students must submit the following information to apply for the PGGUR Program:

1. Two letters of recommendation from members of the applicant's college or university faculty covering academic achievement, career potential and character.

2. Official transcripts (from all institutions attended) covering all undergraduate courses, and a list of courses in the process of completion for the current academic year.

3. A brief typewritten description (1-2 pages) of academic goals and career objective. An explanation of what the student wishes to accomplish through the internship experience is an important factor in determining selection.

4. The following information typewritten on business-size paper: name, current address with telephone number, permanent address with telephone number, social security number, birthdate, university or college presently attending, class, major area of speciality or interest, QPA in major, QPA in science, QPA overall, names of academic references whose letters will accompany application, perferred work period, and information regarding relevant work experience or training (summer jobs, research assistantships, computer use or programming, photographic darkroom experience, etc.)

Applications must be received by February 1, 1987

Send to:

Mrs. Christine Gibbons, Project Manager
Planetary Geology and Geophysics Undergraduate
Research Program
Dept. of Geological Sciences
4240 Ridge Lea Road
State University of New York at Buffalo
Amherst, NY 14226
Phone: 716-877-3724

The PGGUR Program is supported by the Planetary Geology and Geophysics Program Office, NASA Headquarters, Washington DC. Questions concerning this program should be addressed to Mrs. Gibbons or alternatively to Mr. Joseph M. Boyce or Dr. David H. Scott, NASA Headquarters, Code EL-4, Washington DC 20546.

LPI ON SPAN

On October 27, 1986, the LPI was connected as an on-line node on the NASA/SPAN (Space Physics Analysis Network). This adds a new dimension to accessing the various facilities and functions supported by the Institute and brings the Institute a step closer to the scientific community.

SPAN, is a wide area network which connects computers around the country and enables them to communicate continuously at 9600 bauds. It is a unique communications network developed for the space and earth science community. SPAN was developed to increase efficiency and to enhance research interaction among researchers. Scientists at remote nodes can communicate with each other at any time using electronic mail, terminal conferencing and transparent file transfer and access, even though separated by thousands of miles. One feature of SPAN permits an authorized user of one computer on the network to interactively "log on" to another computer and utilize that particular node's unique data analysis software and data files. Another feature allows researchers to access specialized hardware such as supercomputer systems or online archival databases.

Planning for SPAN began in 1980 and operations commenced in 1981. SPAN was originally oriented toward researchers in Solar Terrestrial and Interplanetary Physics, but has now been expanded to serve various other disciplines within the space and earth science community. The Data Systems Users Working Group (DSUWG) has been established to provide SPAN with space science community input and direction.

In 1986, SPAN was reconfigured to take full advantage of NASA's new Program Support Communications Network (PSCN). The backbone of the network is four routing centers at the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland, the Johnson Space Center (JSC) in Houston, Texas, the Jet Propulsion Laboratory (JPL) in Pasadena, California, and the Marshall Space Flight Center (MSFC) in Huntsville, Alabama. Located at each routing center are one or more dedicated computer systems used solely for supporting network communication. These machines are known as DECnet Router Servers and each is tied to the other three remote servers via 56K bits per second dedicated circuits provided by the PSCN. Tail circuits are then used to complete SPAN by connecting various SPAN member institutions located around the country to their nearest routing centers.

There are currently more than one hundred nodes connected directly to SPAN. These are the NASA centers, participating universities, and laboratories. Many local area networks (LAN) are indirectly connected to SPAN. A trans-Atlantic 9.6 Kb/s link between Goddard and West Germany is already in operation and another link to Japan is expected by the end of the year. Gateways to other networks such as ARPANET and BITNET have also been established to greatly expand the reach of the network.

Accessing LPI via SPAN

The SPAN node name for the LPI VAX is **LPI::**. The LPI VAX is first connected via a microwave link at 250Kb/s into the routing center at JSC and from there to the other nodes on the SPAN network. After you have determined that the computer at your home institution is a node on the SPAN network, log on your computer with your usual USERNAME and PASSWORD. Wait for the system prompt, $. Then type in

SET HOST LPI::

The computer will respond with another USERNAME: (from the LPI computer this time) and PASSWORD:. Your response to the USERNAME: prompt may be any of the LPI USERNAME accounts which you have been using through your modem and telephone line.

After you have completed your use of the LPI VAX, type **LOG** after the last system prompt $ or use the log-off instructions in the facility you are using, for example, the "Quit" function in the Search Service. The control will then be returned to your node (your computer).

To send Electronic Mail to LPI via SPAN:

From a SPAN node, you can send mail to the LPI VAX by including the LPI node name (LPI::) as part of the address.
On your own computer, invoke the VAX MAIL utility by typing MAIL after a system prompt, $:
(Computer prompts are in boldface)
$ MAIL
MAIL> SEND
TO: LPI::MAILBOX (or a particular LPI User)
SUBJ: (You choose the subject heading)
Enter your message below. Press CTRL/Z when complete, or CTRL/C to quit:
(Enter your message. When finished do a CTRL/Z)
MAIL> EXIT
$ You are ready to continue on your system.

ON-LINE XVIIIth LPSC PROGRAM

To make the program for the 18th Lunar and Planetary Science Conference available to the community as soon as possible, the program will be on-line on the LPI computer. We are shooting for a target date of February 9. This will be at least two weeks before the *Bulletin* with the preliminary program will be mailed.

To access the online program, you may use either the NASA SPAN network or dial in direct. On SPAN, set the host to the LPI per the instructions given above. To dial direct, call: 713-486-8214 or 713-486-9782. The telephone lines will connect to 300/1200 baud modems.

When connection is made, use the following directions:

USERNAME: Program

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

XVIII LPSC PROGRAM ONLINE

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

A. AUTHOR/SPEAKER NAME

B. SESSION

C. TOPIC (TITLE KEYWORDS)

G. QUIT (EXIT ROUTINE)

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

FUTURE PLANS FOR ACCESSING LPI

Plans are being formed to unify the access to LPI facilities and accounts which we hope to announce in subsequent issues of the *Bulletin* and demonstrate at the LPSC. If you would like more information or have difficulty in accessing the LPI computer, please call Kinpong Leung, LPI Computer Systems Manager at 713-486-2165 or [KLEUNG/NASA] (on Telemail), or LPI::LEUNG (on SPAN).

U.S. SCIENCE TEAM SELECTED FOR JAPANESE SOLAR MISSION

The space agencies of the United States and Japan have announced selection of a U.S. research team for participation in a Japanese-sponsored scientific space mission to investigate the sun. The SOLAR-A mission (previously called the High Energy Solar Physics program) will improve scientists' understanding of high energy phenomena on the sun through x-ray and gamma-ray observations.

The U.S. research team will help provide one set of instruments to be carried on the spacecraft built and launched by the Japanese Institute of Space and Astronautical Science (ISAS). The SOLAR-A mission is planned for launch from Japan into low-Earth orbit in 1991.

The U.S. team is headed by Dr. Loren W. Acton, Lockheed Palo Alto Research Laboratory (LPARL), Calif., who was a payload specialist on NASA's Spacelab-2 Shuttle mission in 1985. Co-investigators include Drs. Marilyn E. Bruner and Alan M. Title, also from LPARL; Prof. Richard C. Canfield, University of Hawaii at Manoa; Dr. Sharad R. Kane, Space Sciences Lab, University of California at Berkeley; and Prof. Peter A. Sturrock, Institute for Plasma Research, Stanford University.

The SOLAR-A mission soft x-ray (less energetic x-ray) telescope team is headed by Professor Tadashi Hirayama, Tokyo Astronomical Observatory, who is the principal investigator of the joint Japanese/U.S. investigation. Professor Yoshiaki Ogawara, ISAS, is the SOLAR-A project manager.

The Acton team was selected following a competitive review of proposals submitted in the accommodation study phase, which will be followed by a contract for development and launch of the SOLAR-A investigation hardware. The competing proposals included most of the outstanding scientists from the U.S. solar x-ray community.

SOLAR-A is expected to be in operation for more than 3 years, continuing the systematic study of high energy solar processes started by the NASA Solar Maximum mission and the ISAS Hinoton mission, both orbited in the early 1980s during the height of the last epoch of maximum solar activity. These activity peaks, during which high energy events called solar flares most frequently occur, appear about every 11 years.

According to Dr. Burton I. Edelson, NASA Assistant Administrator, Space Science and Applications, "terms of the announcement of opportunity, issued by NASA in March 1986, stipulated that the American scientific team will assist in the design and construction of a soft x-ray telescope in cooperation with a counter-part Japanese science team. The U.S. science team is responsible for supplying the optics and detector for the telescope, while the Japanese will provide the supporting electronics, power supply and data control system. All hardware must be fully developed and tested by 1990 to accommodate the 1991 launch date. We view the Solar-A program as another excellent opportunity to continue our long-standing policy of U.S./Japanese cooperation in space science," Dr. Edelson said.

The SOLAR-A spacecraft will be one of a series of small scientific satellites intended to be launched by the Japanese M-3S-II launch vehicle from the Kagoshima Space Center during the August-September 1991 launch window. SOLAR-A will point continuously to the center of the sun. The spacecraft will operate in a circular Earth orbit at an altitude of about 344 miles, with an orbital period of 95 minutes and an inclination of 31 degrees to the Earth's equator.

Dr. David Bohlin, U.S. Solar-A program scientist said, "the scientific groups responsible for development of the SOLAR-A instruments, including U.S. scientists, will have the lead role in data analysis before additional investigators are brought into the program."

Following the initial period of data analysis, SOLAR-A data will become available to other U.S. scientists and the international scientific community through a NASA data center. After the data are deposited in an accessible data bank, NASA plans to provide support for extended data analysis through a Guest Investigator Program, which will be announced in the future.

NASA Press Release 86-153, October 22, 1986

A Reminder to Non-U.S. Citizens Planning to Visit the Johnson Space Center

Non-U.S. citizens who wish to visit laboratories at the NASA Johnson Space Center are reminded that certain actions are required well in advance of the planned visit. NASA rules and procedures require that non-U.S. citizens wishing to make an official visit to JSC (or any other NASA center) should contact their embassy in Washington DC and ask the embassy to request authorization for the visit from the International Affairs Division at NASA Headquarters. NASA Form 1589 "Visit Request and Authorization" which is available from International Affairs Division should be used in making the request.

The visitor should give the dates of the planned visit, names of the NASA persons to be visited, and the purpose of the visit. NASA approval of the visit should be obtained before arriving at JSC. Under some circumstances, this procedure can be shortened if the visitor is a student or faculty member at a U.S. university.

This procedure does not apply to attendance at scientific sessions at the Lunar and Planetary Science Conference held at JSC but does apply to visits to the analytical and curation laboratories at JSC.

NASA SELECTS INVESTIGATIONS FOR COMET RENDEZVOUS MISSION

NASA has selected 38 possible investigations for the Comet Rendezvous Asteroid Flyby (CRAF) mission planned for launch in the early 1990's. The mission is designed to send an unmanned U.S. spacecraft to rendezvous with a comet, fly in formation with it for 3 years and fire an instrumented penetrator into the comet's nucleus. The spacecraft also will make close flybys of two asteroids on its way to the comet encounter.

The announcement was made by Dr. Burton I. Edelson, Associate Administrator, Office of Space Science and Applications, who stated, "this selection is particularly important in that it signifies NASA's commitment to the planetary mission strategy recommended by the Solar System Exploration Committee in 1983. The CRAF mission will be the first of a series to utilize a new planetary-class spacecraft, the Mariner Mark II, designed for missions beyond the orbit of Mars. These, together with the planetary observer missions to the inner planets, symbolize our commitment to a strong program in planetary science and exploration."

The CRAF mission will conduct a detailed study of the composition and physical properties of the comet nucleus and will observe changes that occur as the comet approaches the sun. Other mission objectives include analysis of the gas, dust and plasma comprising the comet's atmosphere and measuring the size, shape and surface properties of the asteroids. The CRAF spacecraft will carry 11 to 14 instruments including cameras, dust analyzers and a nucleus penetrator. Results from a 2-year instrument accommodation study will determine the final payload composition.

The scientific goal of comet and asteroid research is to advance man's understanding of the early solar system history by studying those objects believed to have undergone little change since the system was formed.

Several comets and asteroids have been considered as possible targets for the CRAF mission. The baseline plan calls for the CRAF spacecraft to be launched in late 1992 into an orbit about the sun. After making observations during a flyby of the asteroid Malautra in mid-1993, the spacecraft will swing by the Earth again and a gravity-assist maneuver will boost the spacecraft to the orbit of comet Tempel-2. Following a flyby of asteroid Hestia, rendezvous with the comet will occur in late 1996 near the orbit of Jupiter.

Tempel-2 is a short-period comet that circles the sun once every 5 1/2 years, from near the orbit of Mars out to the orbit of Jupiter. If, for some reason, the CRAF mission cannot be launched in time for the planned Tempel-2 rendezvous, other suitable target comets and asteroids have been identified.

The spacecraft's propulsion subsystem, planned to be provided by the Federal Republic of Germany, will slow the spacecraft and place it in the same orbit as Tempel-2. The spacecraft will fly in close formation with the comet for 3 years, first observing its quiet phase when distant from the sun and then observing the formation of the coma, dust and plasma tails as the comet nears the sun and becomes active. In 1997, the spacecraft will target and release an instrumented probe to penetrate the surface of the comet's nucleus and to make direct measurements of its composition, temperature and surface structure.

The penetrator is a pointed, spear-like projectile designed to penetrate the comet's nucleus to a depth of up to 1 meter. It will carry five instruments: a gamma-ray spectrometer to measure the elemental composition of both ice and non-volatile material; an accelerometer to measure the strength and structure of the surface; thermometers to measure the temperature profile with depth and thermal conductivity; a calorimeter to detect phase changes as an ice sample is heated; and a gas chromatograph to determine the amounts and types of gaseous molecules released from the ice sample.

Dr. William Quaide, Chief Scientist, Solar System Exploration Division, said "clearly, the most exciting aspect of this mission is the penetrator package. No one has ever sent a projectile into the nucleus of a comet."

Comets are thought to be the most pristine and unaltered samples of the early solar system, and many scientists believe comets may contain remnants of the primordial matter from which the solar system formed. The most accepted model of a comet nucleus is the "dirty snowball" model, a mixture of ices, silicate minerals and possibly metals. The ices are solid, frozen substances that usually are liquids or gases under more familiar conditions. These may include water, methane, carbon dioxide, ammonia and more exotic species.

Observations of Comet Halley earlier this year indicated that the surface of its nucleus is almost black, suggesting the presence of carbon compounds and perhaps complex organic molecules. Asteroids are small rocky objects orbiting the sun between Mars and Jupiter. They also are believed to be remnants of early solar system material, some may be fragments of larger objects broken apart by collisions.

CRAF mission development and operations will be conducted by NASA's Jet Propulsion Laboratory, Pasadena, Calif. Ronald F. Draper is the project manager and Dr. Marcia M. Neugebauer, the project scientist. The CRAF program is managed by the Office of Space Science and Applications, NASA Headquarters.

NASA Press Release 86-150, October 20, 1986

ECG PROJECT NEWS

The *Early Crustal Genesis Program* is now beginning its fourth year of funding for proposals and its sixth year for sponsoring workshops and field conferences. Several activities are being planned to continue the research done under the aegis of this project.

Continental Growth Workshop

A workshop on "The Growth of Continental Crust" will be held at Oxford University, July 13-17, 1987. The dates for this workshop were selected to fall between the schedules for the 50th Annual Meteoritical Society Meeting (July 20-25 in Newcastle) and the Workshop on Continental and Oceanic Lithosphere (July 6-11 in London). The Continental Growth Workshop will be convened by Stephen Moorbath and Paul N. Taylor (Oxford University) and Lewis D. Ashwal (Lunar and Planetary Institute). The first announcement and indication of interest form have been sent out from the LPI. If you have not yet received a copy and are interested in participating in this workshop, contact Pam Jones, LPI, 713-486-2150.

Field Workshop, South India

A field workshop on *The Deep Continental Crust of South India* is planned for December 1987. Major funding for the workshop has been requested from the National Science Foundation. If approved, all expenses, including travel and subsistence for about 60 participants will be covered by the U.S.-India Cooperative Science Program of NSF. Conveners of the workshop will be Robert C. Newton (University of Chicago), Lewis D. Ashwal (Lunar and Planetary Institute), and B.P. Radhakrishna (Geological Society of India). The workshop will consist of a 2-4 day technical session, and a 14-day series of field excursions led by experts from India and elsewhere. The field excursions will focus on several outstanding problems of crustal genesis, including the relationship between Archean cratons and mobile belts, structure and tectonics of the deep continental crust, late Archean crustal growth, and granulite facies metamorphism and fluid action. The first announcement on this workshop should be circulated sometime in January 1987.

Origin of the Earth Conference

A three or four day conference is in the planning stages and tentatively scheduled for Fall, 1988, on the *Origin of the Earth*. The conveners will be John H. Jones (University of Arizona) and Horton E. Newson (University of New Mexico). The purpose of the conference is to consider fundamental unsolved questions relating to the origin of the Earth, including whether the Earth was substantially molten, how the major geochemical reservoirs of the Earth formed, and the fate of the primordial terrestrial atmosphere. It is anticipated that papers from this conference will result in a book similar to the "Origin of the Moon" which was published by LPI in July 1986. Announcements regarding this conference will be circulated soon.

NEW PUBLICATIONS

If you are interested in obtaining any of the items in the ***New Publications List*** do contact the publisher or supplier listed with each item. The LPI is not a distribution center tor any of these publications, nor is the listing here to be construed as an endorsement.

AAAS Publishes Reprints from Science

The American Association for the Advancement of Science has published *Astronomy and Astrophysics*, a collection of twenty-four articles from *Science* between 1982-84, ranging from the solar system to pulsars. Research techniques and instruments described cover such topics as proton decay, the Very Large Array, and the proposed Space Station as a platform for future experiments. These articles were selected for their depth of coverage and breadth of topics by Morton S. Roberts, past Director of NRAO. The volume is 400 pp., fully indexed and illustrated, and has color plates. A hardcover copy is $29.95, and softcover $17.95. Contact: AAAS, 1333 H St. NW, Washington DC 20005.

(From AAAS Newsletter Number 32, October 1986)

Astrophysical Novel by Clayton

Donald D. Clayton has had a work of scientific fiction published by Texas Monthly Press (P.O. Box 1569, Austin TX 78767). The astronomical portion is built around a faithful reproduction of the solar neutrino puzzle, made dramatically tense by a high-stakes international intrigue to suppress an unexpected change in the data rate. Following the murder of the observer and the destruction of his lab, a secret scientific investigation uncovers a horrifying implication for mankind that simultaneously clarifies our origin. Clayton describes it as "a

thriller that is simultaneously a parable of mankind," and he suggests that giving it to laymen may be a beneficial way of sharing astronomy's excitement and relevance with the public. The *Joshua Factor* retails for $15.95.

(From *AAAS Newsletter* Number 32, October 1986)

New Geology Catalog Available

MMI Corporation announces the publication of a new catalog of *Geology Teaching Materials* to be released in the fall of 1986. The catalog will include audio-visuals for Physical and Historical Geology including slides, transparencies, videocassettes, slide & cassette programs plus a large variety of apparatus for demonstrating basic principles of geology. A large number of Geology Laboratory Manuals will also be included as well as a selection of charts and maps. While the material is intended for the college level geology course, much of the material is also applicable to the secondary and general adult level of study. The catalog will be sent free of charge to educators and researchers writing on their business letterheads. MMI Corporation has supplied teaching materials for Astronomy, Physics, Geology and Earth and Space Sciences for the past 13 years to colleges and universities, researchers, observatories, planetariums, and similar institutions.

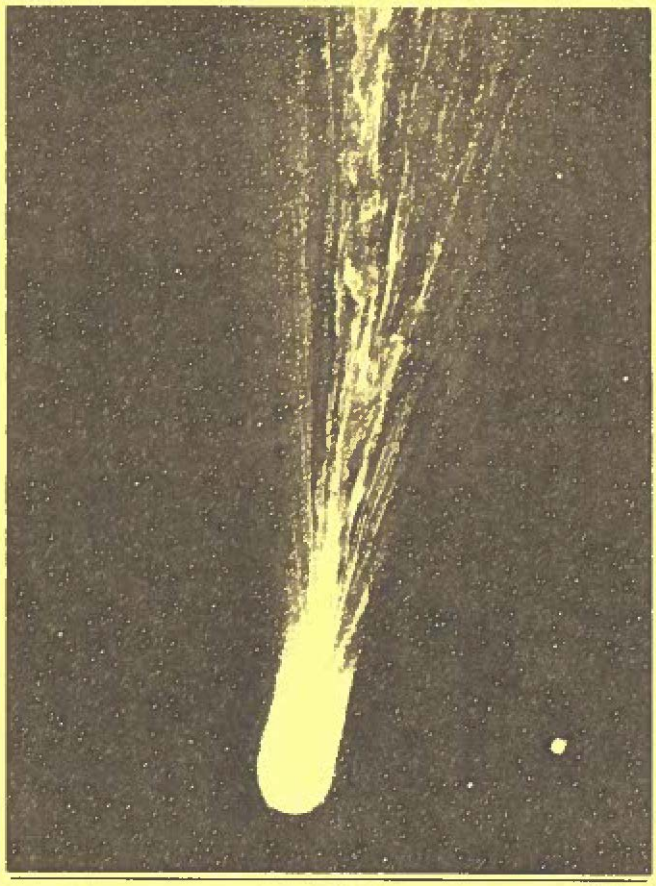
(Press Release, MMI Corporation)

Astronomical Society of the Pacific - New Releases

A new *Selectory* (catalog) of educational materials on astronomy has been published by ASP. Their 1987 Selectory includes slides, posters, charts, audiotapes, sky observing aids, and even a few astronomical bumper stickers. This year there are expanded sections on astronomical software (including some of the best home planetarium programs for several types of computers and items for youngsters. Also new in the catalog is a videotape narration by the discoverer of the planet Pluto about his work, an inexpensive but high quality first telescope, and slides of the very best views of Comet Halley during its recent pass. To receive a copy, send two first-class stamps with your name and address to A.S.P. Catalog Request Dept.

A new set of 17 slides showing some of the most spectacular views of Halley's Comet during its recent pass has been released by ASP. Assembled by noted comet expert, Dr. John C. Brandt of NASA, the set includes pioneering close-up views of the comet's icy core taken by the Giotto and Vega spacecraft, as well as marvelously detailed photographs of the comet's complex tail system taken with large telescopes on Earth. Three of the photographs show portions of the tail becoming disconnected from the rest and a new tail system forming. Also included are unusual images taken with the Pioneer spacecraft in orbit around Venus and the Very Large Array radio telescope in New Mexico. A substantial booklet with detailed captions and a summary by Dr. Brandt accompanies the set. Copies are available for $16.50 (which includes postage and handling) from A.S.P. Halley Slides Dept.

A set of 30 beautiful color slides taken of and from the Space Shuttle has been assembled for ASP by astronomer and Shuttle Spacelab Mission Specialist, Dr. Michael Lampton. The slides show some of the most striking views of the Shuttle above the Earth, the operation of the Manned Maneuvering Unit, the Rescue of the Solar Max Satellite, and several of the scientific experiments carried out during the Spacelab missions. A booklet of detailed captions by Dr. Lampton describes each view in the context of the full Shuttle program, shows a diagram of the Shuttle with its most important characteristics, and provides an introductory reading list of Shuttle books and articles. Designed for teachers, space enthusiasts, and the general public, the set is available from ASP Shuttle Slides Dept., for $24.95.



Halley's Comet in March, 1986— *This photograph taken with the UK Schmidt Telescope in Australia was developed by using special image-enhancement techniques to bring out a wealth of detail in the comet's gas tail. (Photograph by Dr. David Malin of the Anglo-Australian Observatory; from the slide set "Halley's Comet Revealed" produced by the Astronomical Society of the Pacific.)*

Astronomy as a Hobby is a new nontechnical information packet on becoming involved with astronomy as a hobby has just been published by ASP. Whether you simply enjoy reading about astronomy in your favorite armchair or you have the urge to go out and explore the night sky for yourself, the 28-page packet has practical, "down-to-earth" advice about the steps to take, the books and magazines you can read, and the local or national groups which can provide support and

information. A section on selecting a first pair of binoculars for skygazing, a clear basic glossary of astronomical terms, and a series of introductory articles on our modern view of the universe round out the illustrated guide. To receive a copy of the packet, send $3.00 to Hobby Packet Dept., ASP.

The address for all of the above items from ASP is:

A.S.P.
1290 24th Avenue
San Francisco CA 94122

New for Teachers

Teaching Space, a newsletter for educators intent on bringing the excitement of the new frontier down to Earth and into the classroom, is published by the Midwest Space Development Corporation. Besides current space news and space science and technological information, this newsletter also carries photo-ready classroom activity sheets about space. You get five issues per year (August to April) for $7.00. To contribute and/or subscribe, write to Dennis Coombs, Executive Editor, Teaching Space, P.O. Box 19270, Cincinnati, OH 45219.

(From L5 News v.1 no.2)

Shuttle Views the United States is a set of 20 slides of the geology and geography of the United States as the shuttle astronauts see it. The set includes supporting notes written especially for teachers. Originally planned as part of the Mission 51-L "Teacher in Space Project", the slide set may be ordered for $12.00 per set ($4.00 extra for foreign postage). Payment by cash, check or money order, made payable to P.A. Jones, should be sent to: Pat Jones, P.O. Box 590853, Houston TX 77259-0853.

ECG Technical Reports

Three new LPI Technical Reports have been published recently on ECG workshops and field trips.

- 86-04 *Workshop on Early Crustal Genesis: The World's Oldest Rocks*, edited by L.D. Ashwal. Proceedings of the LPI Field Workshop in the Godthaabsfjord region, West Greenland, July 21-30, 1985. U.S. $3.00; Foreign air mail $7.75; Foreign surface mail $4.00.
- 86-08 Workshop on the Earth as a Planet, edited by L.D. Ashwal, K. Burke, M.J. de Wit, and G. Wells. Proceedings of the LPI workshop held prior to the 1985 GSA Meeting in Orlando Florida. U.S. $3.00; Foreign air mail $5.50; Foreign surface mail $3.00.
- 86-10 *Workshop on the Tectonic Evolution of Greenstone Belts*, edited by M.J. de Wit and L.D. Ashwal. Proceedings of the LPI workshop held January 16-18 1986. U.S. $3.00; Foreign air mail $9.50; Foreign surface mail $4.50.

These reports may be obtained from the Order Department at the LPI. See order form in this BULLETIN.

QUESTION: Would You Order Hardcover Copies of Past Proceedings?

At the request of the Planetary Meetings Steering Committee (following suggestions made during last year's LPSC Forum), LPI has explored the possibility of making available hardbound copies of the LPSC Proceedings published with AGU (13th, 14th, 15th, 16th).

LPI will be able to purchase softcover copies from the AGU inventory and have them bound. The Proceedings would be bound in one book instead of the two separate books AGU provides. LPI would provide these copies at cost, which will run about $20 for each Proceedings.

If you are interested in ordering hardbound Proceedings, please complete the form below and return it to the Publications Office. If there is adequate interest in this project, LPI will notify those who are interested and order copies as requested.

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Proceedings of the Fourteenth LPSC	____
Proceedings of the Fifteenth LPSC	____
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The next issue will be in FEBRUARY. Copy deadline is JANUARY 23, 1987. If you have any announcements which you would like to have printed in the ***BULLETIN***, please send them to the Editor.
We reserve the right to select and edit copy.

Editor: Frances B. Waranius
Lunar and Planetary Institute
3303 NASA Road One
Houston, TX 77058-4399
Phone: 713/486-2135

CALENDAR

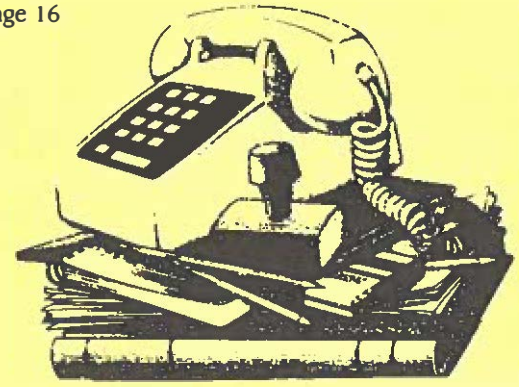
November 4-7	**American Astronomical Society Division for Planetary Sciences**, 18th Annual Meeting, Paris, France	Catherine de Bergh Observatoire de Meudon 92190 Meudon, France
November 10-13	**Geological Society of America Annual Meeting**, San Antonio, Texas.	Jean Kinney Geological Society of America P.O. Box 9140 Boulder CO 80301 Phone: 303-447-2020
December 1-5	**Symposium on Materials Processing in the Reduced Gravity Environment of Space**, Boston, Massachusetts	R.H. Doremus Materials Engineering Dept. Rensselaer Polytechnic Institute Troy NY 12180 Phone: 518/266-6373
December 8-12	**American Geophysical Union** Fall meeting, San Francisco, California.	American Geophysical Union 2000 Florida Avenue NW Washington DC 20009 Phone: 202-462-6903
December 15-19	**Space Exploitation and Utilization**, Sheraton Waikiki Hotel, Honolulu, Hawaii	American Astronautical Society 6212-B Old Keene Mill Court Springfield VA 22152 Phone: 703-866-0020
December 17-19	**International Confernece on SPOT 1: First Inflight Results**, Toulouse, France.	SPOT Image Corporation 1897 Preston White Drive Reston VA 22091-4326 Phone: 703-620-2200

1987

January 4-8	**169th Meeting of the American Astronomical Society**, Vancouver, British Columbia.	Alan Dressler Mt. Wilson & Las Campanas Observatories 813 Santa Barbara Street Pasadena CA 91101 Phone: 213-577-1122
January 6-9	**Meteorites and the Early Solar System Conference**, Tucson, Arizona.	Dr. John Kerridge Institute of Geophysics University of California Los Angeles CA 90024 Phone: 213-825-3331

January 12-16	**AIAA Aerospace Sciences Meeting**, Reno, Nevada	Dr. Archibald L. Fripp Mail Stop 473 NASA Langley Research Center Hampton VA 23665
February 14-18	**American Association for the Advancement of Science, Annual Meeting**, Chicago, Illinois.	AAAS Meetings Office Annual Meeting 1333 H Street NW Washington DC 20005
March 10-14	**Origin and Evolution of Planetary and Satellite Atmospheres Conference**, Tucson, Arizona.	Sushil K. Atreya University of Michigan Space Research Building Ann Arbor MI 48109-2143
March 16-20	**XVIIIth Lunar and Planetary Science Conference Houston, Texas.**	
April 9-14	**European Geophysical Society, XII General Assembly**, Strasbourg, France.	M.M. Cara Institut de Physique du Globe 5 rue R.Descartes F-67084 Strasbourg CEDEX France Phone: +33-88-604110
April 13-16	**1987 European Union of Geosciences Biennial Meeting**, Strasbourg	Organizing Committee EUG IV Dept. of Earth Sciences ETH-Honggerberg CH-8093 Zurich, Switzerland
May 5-7	**Pecora XI: Satellite Land Remote Sensing — Current Programs and a Look to the Future**, Sioux Falls, South Dakota.	Pecora XI Symposium EROS Data Center Sioux Falls, SD 57198
May 10-15	**Impact of VLBI on Astrophysics and Geophysics**, Cambridge, Massachusetts. IAU Symposium no. 129.	J. Moran Center for Astrophysics Mail Stop 42 60 Garden Street Cambridge MA 02138
May 17-19	**1987 Houston Space and Telecomm Symposium** Houston, Texas.	Space and Telecomm, Inc. P.O. Box 230192 Houston TX 77223 Phone: 713-225-1950
May 18-22	**American Geophysical Union Spring Meeting**, Baltimore, Maryland.	American Geophysical Union Spring Meeting 2000 Florida Avenue NW Washington Dc 20009 Phone: 202-462-6903
June 14-18	**170th Meeting of the American Astronomical Society**, Vancouver, British Columbia.	Harvey Richer Dept. of Geophysics and Astronomy University of British Columbia Vancouver BC V6T 1W5 Canada Phone: 604-228-4134

July 6-10	International Workshop **Cryptoexplosions and Catastrophes in the Geological Record**, Parys, South Africa	Organising Committee Cryptoexpolosions Workshop Bernard Price Institute of Geophysical Research University of the Witwatersrand 1 Jan Smuts Avenue Johannesburg 2001 South Africa
July 6-11	**Continental and Oceanic Lithosphere: Similarities and Differences**, University of London, Royal Holloway and Bedford New College, England.	Steve Bergman Arco Exploration and Technology Corp. 2300 West Plano Pkwy. Plano TX 75075 Phone: 214-422-6264
July 13-17	**Growth of Continental Crust**, Oxford University, England.	Pam Jones Lunar and Planetary Institute 3303 NASA Road One Houston TX 77058-4399 Phone: 713-486-2150
July 14-16	**99th Annual Meeting of the Astronomical Society of the Pacific,** Pomona College, Pomono, California.	Summer Meeting A.S.P. 1290 24th Avenue San Francisco CA 94122 Phone: 415-661-8660
July 15-16	**Solar System- -Chemical Clues to Its Origin**, Royal Society of London, England.	Miss C.A. Johnson The Royal Society 6 Carlton House Terrace London SW1Y 5AG England
July 20-24	**50th Annual Meeting of the Meteoritical Society**, Newcastle upon Tyne, England.	Dr. D.W. Collinson School of Physics The University Newcastle upon Tyne NE1 7RU England Phone: 091-232-8511
August 9-22	**XIXth General Assembly of the International Union of Geodesy and Geophysics**, Vancouver, British Columbia, Canada	Conference Secretariat c/o Venue West #801 - 750 Jervis Street Vancouver, B.C., Canada V6E 2A9
August 17-21	**7th International Conference on Basement Tectonics**, Queen's University, Kingston, Ontario, Canada.	7th International Conference on Basement Tectonics c/o Events Management Inc. 4 Cataraqui Street, Suite 209 Kingston Ontario Canada K7K 1Z7 Phone: 613-547-5093



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THE MOON

BENZ,W. + SLATTERY,W.L. + CAMERON,A.G.W. (THEORETICAL ASTROPHYSICS GROUP, T-6 MS B288, LOS ALAMOS NATIONAL LAB., LOS ALAMOS, NM 87545): THE ORIGIN OF THE MOON AND THE SINGLE-IMPACT HYPOTHESIS I
ICARUS VOL. 66, 515-535 (1986)

BIRNIE,D.P. + DYAR,M.D. (DEPT. OF MATERIALS SCIENCE AND ENGINEERING, MIT, CAMBRIDGE, MA 02139): COOLING RATE CALCULATIONS FOR SILICATE GLASSES
PROCEEDINGS OF THE SIXTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE, PART 2, JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 91, NO. B4, PAGES D509-D513, MARCH (1986)

BLANFORD,G.E. + BORGESEN,P. + MAURETTE,M. + MOLLER,W. + MONART,B. (UNIV. OF HOUSTON AT CLEAR LAKE, 2700 BAY AREA BLVD., HOUSTON, TX 77058): *ON-LINE* ANALYSES OF SIMULATED SOLAR WIND IMPLANTATIONS OF TERRESTRIAL ANALOGS OF LUNAR MATERIALS
PROCEEDINGS OF THE SIXTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE, PART 2, JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 91, NO. B4, PAGES D467-D472, MARCH (1986)

BOSS,A.P. (DEPT. OF TERRESTRIAL MAGNETISM, CARNEGIE INSTITUTION OF WASHINGTON, 5241 BROAD BRANCH ROAD, N.W., WASHINGTON, DC 20015): PROTOEARTH MASS SHEDDING AND THE ORIGIN OF THE MOON
ICARUS VOL. 66, 330-340 (1986)

CONWAY,B.A. (DEPT. OF AERONAUTICAL AND ASTRONAUTICAL ENGINEERING, UNIV. OF ILLINOIS, URBANA, IL 61801): STABILITY AND EVOLUTION OF PRIMEVAL LUNAR SATELLITE ORBITS
ICARUS VOL. 66, 324-329 (1986)

DELANO,J.W. (DEPT. OF GEOLOGICAL SCIENCES, STATE UNIV. OF NEW YORK, ALBANY, NY 12222): PRISTINE LUNAR GLASSES: CRITERIA, DATA, AND IMPLICATIONS
PROCEEDINGS OF THE SIXTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE, PART 2, JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 91, NO. B4, PAGES D201-D213, MARCH (1986)

GOODRICH,C.A. + TAYLOR,G.J. + KEIL,K. + KALLEMEYN,G.W. + WARREN,P.H. (INST. OF METEORITICS, DEPT. OF GEOLOGY, UNIV. OF NEW MEXICO, ALBUQUERQUE, NM 87131): ALKALI NORITE, TROCTOLITES, AND VHK MARE BASALTS FROM BRECCIA 14304
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GOUSIDOU-KOUTITA,M. (DEPT. OF MATHEMATICS, UNIV. OF THESSALONIKI, THESSALONIKI, GREECE): A STUDY OF COLLISION ORBITS WITH THE MOON BY THE METHOD OF SURFACE OF SECTION
EARTH, MOON, AND PLANETS VOL. 36, 49-61 (1986)

LAUL,J.C. (CHEMICAL TECH. DEPT., BATTELLE, PACIFIC NORTHWEST LABS., RICHLAND, WA 99352): CHEMISTRY OF THE APOLLO 12 HIGHLAND COMPONENT
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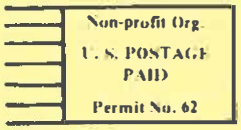

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