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lunar & planetary information bulletin

NUMBER 26 FEBRUARY 1981

12th LUNAR AND PLANETARY SCIENCE CONFERENCE

15-20 MARCH 1981

The TWELFTH LUNAR AND PLANETARY SCIENCE CONFERENCE will begin Sunday, March 15 at 6:00 p.m. with registration and an open house at the Lunar and Planetary Institute. A shuttle bus will run between NASA area hotels and the LPI from 5:45 to 9:30 p.m. Registration will continue throughout the conference at the Gilruth Center at JSC. For the first time, all conference activities, technical sessions, exhibits, etc., unless otherwise listed will be at the Gilruth Center.

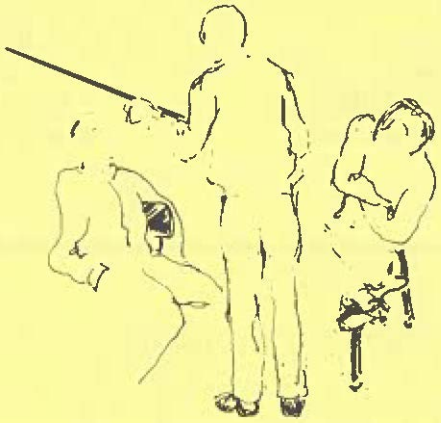
From a total of 434 abstracts accepted for publication in *Lunar and Planetary Science XII*, the Program Committee has constructed twenty-three sessions for a total of 272 oral presentations. Sessions were constructed based on the comparison of author-submitted key-words with logical subject "trees", which identified broader subject topical areas. It is likely that some of the former topical interests will re-appear, but this new method should provide greater visibility to new areas of interest than was available previously.

The preliminary program included in this issue reflects plans for the Conference as they exist on 6 February. Minor changes may yet occur before the Conference itself. Indexes to the speakers and to the authors of papers in the oral technical sessions will be found following the daily schedules. (See Appendix to this Bulletin)

Some *CONFERENCE HIGHLIGHTS* this year include:

Posters entered in the *Technical Poster Session* will be on display each day of the Conference. A preliminary list of the ten poster exhibits now scheduled is included at the end of the author index.

Wednesday afternoon has been reserved for *Special Topical Symposia*. At press date, a workshop on Early Crustal Genesis and a workshop on Utilization of Non-Terrestrial Resources for Space Exploration and Exploitation are scheduled.



On Tuesday evening at 8:00 p.m., a *Public Forum on the Voyager Encounter at Saturn* will be held in the Building 2 Auditorium. Members of the Voyager-Saturn team will present some of the results of the mission. The talks will include slides and computer-enhanced films of the encounter.

Wednesday evening will be the kick-off of the annual LPI Chili Cook-off. Approximately 20 teams from various universities and government centers will be competing for top honors of "best chili". Tickets for the Cook-off and BBQ dinner will be on sale at the registration desk until Tuesday noon, March 18. Cost of the evening will be $10-12 per person. . . beer included.

The *JSC Astronomer's Brownbag Luncheon Club* will present "The Case for Man-on-Mars by 1999" by James Oberg. The meeting will be at noon in the Building 31 Conference Room. It will last about an hour. Bring your lunch and brownbag it.

The summary session has been eliminated again this year in favor of an extra technical session. Publication of the summaries is scheduled for a summer issue of *Geotimes*, probably the June issue.

Advance sets of the Abstract volumes will be mailed to participating PI's and to first authors of independent papers at the end of February. The final sets will be available to registrants at the Conference. Copies will also be available after the Conference by mail. L&PS XII will be $2.00 U.S.; Foreign: Air printed matter $37.50; surface $9.00. To order a set of 12th Conference Abstracts, send check or money order made out to Lunar and Planetary Institute, to the Library/Information Center at the LPI.

PRELIMINARY PROGRAM INDEX
BULLETIN APPENDIX

THE FLIGHT OF COLUMBIA

by James E. Oberg

Watching the upcoming Space Shuttle orbital mission can be far more interesting than some recent newspaper stories might lead you to believe. The mission is, in fact, one of genuine space drama, not a ho-hum revival of manned spaceflight.

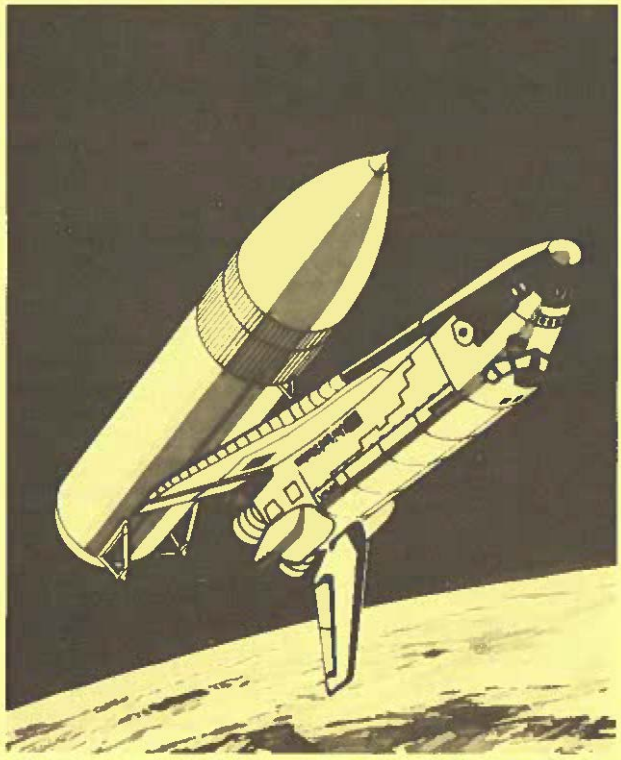
That's because Columbia will usher in a new era in space-vehicle design. The first flight is extremely complex and difficult (as evidenced by the two-year delay). The technological challenges have probably been at least as difficult as those involved with the Apollo moon landings a decade ago. Today it only looks easy— and it is the fervent wish of space engineers that the entire two-day flight will *appear* to be boring. Excitement usually means surprises, and surprises usually mean trouble.

To help you to fully appreciate the demands and hoped-for successes for the Space Shuttle, I've compiled a list of ten events that represent critical phases during the mission:

1. *Ignition and Lift-Off.* This phase is always tense, but especially this time, since the Space Shuttle will experience new stresses as the unbalanced engines— three liquid and two solid— each strain upward, seeking mechanical equilibrium within the spaceship's structure. Once Columbia clears the tower, we can all breathe easier.

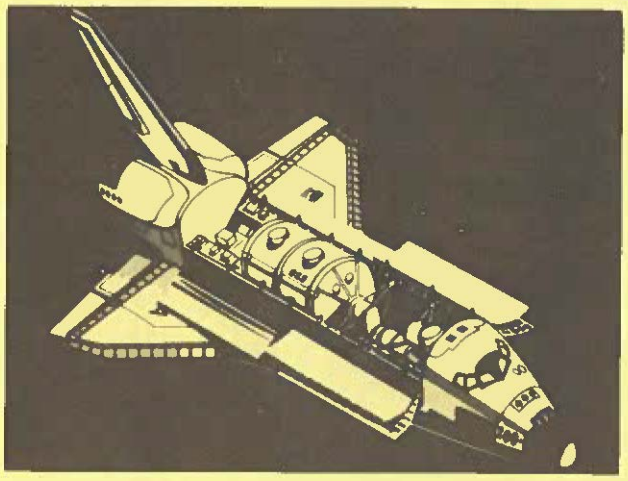
2. *SRB Sep.* The twin parallel-staged solid rocket boosters burn out and fall away two minutes after lift-off. Since there's no way to turn them off once they ignite, they have to burn out almost simultaneously, or else there will be a tremendous off-center thrust vector that could tumble the vehicle (and by now the ship is much too high for the crew to bail out successfully). Parallel-staged solid boosters have always worked perfectly in the Titan-3 series (they helped launch the Voyager probes), but these SRB's are much bigger.

3. *ET Sep.* The giant external tank with the liquid-oxygen and liquid-hydrogen propellants (the world's largest throwaway soft-drink can) is discarded seconds after the Columbia's three main engines cut off, about nine minutes into the flight. This separation of the two side-by-side giants— the external tank and the Columbia— is done *very* carefully, since recontact could damage the spaceship's thermal tiles and doom the astronauts. The tank's motion could be complicated by venting propellants, but after a minute or so the Columbia will be at a safe distance.



4. *OMS Burn.* The spaceship is still not in a stable orbit (together with the external tank, it is headed for a ballistic impact in the far southern Indian Ocean), so two auxiliary engines that comprise the OMS or orbital maneuvering system, must be fired twice in the next 30 minutes to raise the orbit to about 135 miles. These engines and propellant feed systems are brand-new, even revolutionary, in their design— and they're crucial.

5. *OPS Transition.* The Columbia's computerized flight-control system uses an autopilot of such complexity that the spacecraft's computer can only hold enough instructions for a few mission phases at a time. An hour after launch the next set has to be transferred from a magnetic-tape unit before the new operational phase can begin— otherwise, backup systems must be activated, and the mission would be in doubt.



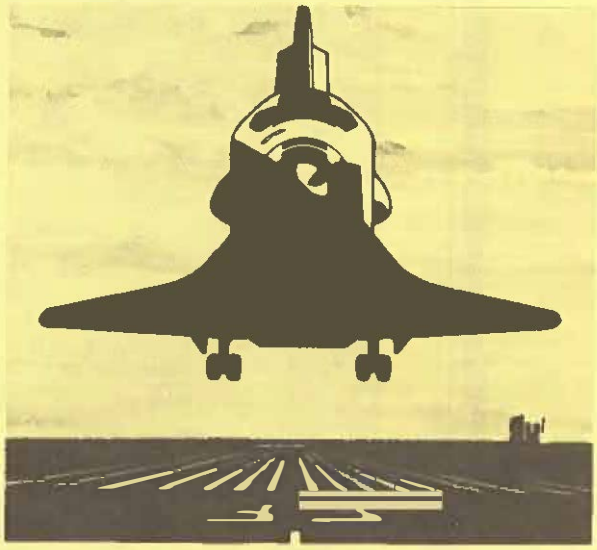
6. *Door Operations.* Opening the payload bay doors so that cargo can be released or instruments exposed to space will be crucial on operational flights. But it's also critical to expose the thermal radiators that "dump" the spaceship's excess heat from its electronic equipment. Therefore, the doors must open if the flight is to continue, and later they must close and latch securely if the ship is to survive the stresses of atmospheric reentry.

7. *APU Start.* Before returning to Earth, the astronauts must activate the hydraulic pressure system that drives the aerodynamic control flaps on the wings, tail, and back end of the fuselage. There are three auxiliary power units (APUs) for this purpose; without them, the spaceship would tumble out of control in the air and disintegrate— and it would happen at too great an altitude to utilize the ejection seats.

8. *Deorbit Burn.* Using the orbital-maneuvering-system engines (or, in an emergency, four smaller reaction-control-system engines hooked up to the OMS fuel tanks), the spaceship slows its velocity by about 1 percent, dipping down into the atmosphere where air drag does the rest of the deceleration. If the pointing and firing of these rockets is not absolutely precise, the Columbia may miss its landing strip.

9. *Hypersonic Regime.* The winged spaceship glides back into the atmosphere at Mach 25, controlled by a combinatin of aerodynamic flaps and directional rockets. As the velocity drops, the flight-control characteristics of the airflow change markedly. The computer autopilot, unaccustomed to these laws of aerodynamics, must anticipate and react to them.

10. *TAEM.* The terminal-area-energy-management phase involves the final approach to the runway, as the winged Columbia husbands its momentum carefully to allow it to reach the end of the runway just when it can fly no further. Beyond this point in the flight, drop tests of the Enterprise Space Shuttle in 1977 showed that the actual touchdown is very straightforward— for a space mission!



In the final seconds of the flight, two sensors on Columbia's main landing gear will transmit the signal "weight-on-wheels," followed a few seconds later by a third sensor's report "weight-on-nose-gear." And so ends the first reusable-spacecraft mission.

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James Oberg is a computer expert at NASA's Mission Control in Houston. He is also a prolific author on spaceflight and astronomy topics and is regarded as one of the West's leading authorities on the Soviet and Chinese space programs. All opinions expressed are based on his own personal research and analysis and cannot be construed to reflect NASA policy.

HAROLD CLAYTON UREY

1893-1981

Dr. Urey....Nobel prize winner...teacher...chemist...
founder of modern lunar science.
A brilliantly innovative scientist...a Midwestern patriot.
Sometimes stubborn, petulant and fractious.....
usually genial, fond of gardening and notoriously
absent-minded.....
possessing an incredible capacity for scientific concentration
.....remembered by many.....

If the fire of grief gave off smoke,
the world would be plunged into darkness.
(Near Eastern proverb)

AGU SPECIAL SESSIONS PLANNED

The Planetology Section of the American Geophysical Union is sponsoring a number of special sessions at the Spring Meeting to be held May 25-29 in Baltimore, Maryland.

Geologic Processes on Icy Planetary Bodies
Organized by E. M. Parmentier, Brown University

The session will deal primarily, but not exclusively, with the Jovian satellites, Europa, Callisto and Ganymede. The submission of abstracts on geological characteristics and physical processes of surface and interior evolution are invited. Co-sponsor of the session is the Tectonophysics Section of AGU.

Pre-Cambrian Evolution of the Earth
Organized by F. Richter, University of Chicago, and K. Burke, SUNY-Albany

The purposes of the session are to bring together workers in fields that bear on the development of the Earth as a physical and chemical system, and to integrate the ideas and data on terrestrial evolution from both comparative planetology and earth-oriented approaches. The subject matter will include accretion and initial chemical segregation, thermal development, chemical and isotopic evolution, and development of the atmosphere. Some papers will be invited but contributed papers are most welcome. This session is co-sponsored by the Volcanology, Geochemistry and Petrology Section of AGU.

Tectonics of Venus and Earth: a Comparison
Organized by J.W. Head, Brown University

The recent Pioneer mission to Venus has provided global information on the topography of Earth's twin planet and data on its gravity and magnetic fields. A special session will be held emphasizing characterization of Venus and comparison to Earth. Specific emphasis will be on description, comparison, and interpretation of surface topography, lithospheric structure and evolution, thermal models, and gravity and magnetic fields. The session co-sponsors are Tectonophysics and Geodesy Sections.

To participate in these sessions or to obtain additional information, contact the organizers. Deadline for abstracts is 4 March 1981.

CONFERENCES ON REMOTE SENSING PROGRAMS ANNOUNCED

As part of the expanding dialogue taking place between NOAA and non-Federal users of remotely sensed land data, NOAA will host a series of one-day conferences in Spring 1981. NOAA, as manager of U.S. civil operational earth remote sensing satellite activities, is developing an operational land program for the 1980's and beyond. The purpose of these conferences is to help NOAA achieve an operational land system as responsive to the needs of non-Federal users as technology and available resources will allow.

During the conferences, NOAA will report on the status of current and projected operational land system activities. Some product line and service function options that are possible under the initial operational system, which will be based on Landsat-D technology, will be described. NOAA strongly desires to obtain the reactions of non-Federal users to these topics. The objective of the conferences is dialogue, however, and the major portion of the program will be reserved for this purpose.

Some of the conference locations and dates are:

Atlanta, Georgia
March 23, 1981

Monterey, California
April 2, 1981

Austin, Texas
April 28-29

West Lafayette, Indiana
May 21, 1981

Inquiries concerning the conferences should be directed to:

METRICS, INC.
290 Interstate North
Suite 116
Atlanta GA 30339

IAU COLLOQUIUM PLANNED

High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations will be the topic of an International Astronomical Union Colloquium No. 63 to be held in Grasse, France, 22-27 May 1981, co-sponsored by ICSU Committee on Space Research (COSPAR) and International Association of Geodesy/IUGG.

The dynamics of the Earth-Moon system, in which there are strong interactions between orbital, rotational and deformational motions, has provided many clues to the understanding of solar system physics and astronomy. In this context, the study of the rotation of Earth represents a major interface between astronomy and geophysics, and several new "space-age" observing techniques are being applied to this problem. The IAU Colloquium was originally conceived in the framework of the Lunar-Laser program EROLD (Earth Rotation from Lunar Distances), but the scientific scope is enlarged beyond Earth rotation, due to the many astronomical and geophysical implications of the subject. The topical coverage is intended to include all relevant aspects of high-precision Earth-Moon dynamics, theoretical as well as observational results, including:

- Observational determination of Earth rotation from Lunar-Laser ranging and comparisons with other high-precision techniques;
- New developments in the dynamics of the Earth-Moon system (orbital and rotational motions);
- Geophysical and selenophysical interactions with the orbits and rotations of Earth and Moon (gravity fields, tide models, dissipation, etc.);
- Relativistic influences in the Earth-Moon system.

The basic program is strictly oriented to scientific applications and results. However, it will follow immediately the first technical workshop on the operational aspects of the short observing campaign of the program MERIT (Monitoring of Earth Rotation and Intercomparisons of Techniques); a joint session of this Workshop and the Colloquium will take place on 22 May 1981, for topics of common interest, including any initial scientific results from the MERIT short campaign.

The Call for Papers and supplementary information will be issued later this year. Attendance is limited both for topical and logistic considerations, to invited participants. Further details and application forms may be obtained by contacting the principal organizer:

Dr. O. Calame
CERGA
Av Nicolas Copernic
06130 GRASSE, France

The MERIT Workshop is being organized separately by Dr. G. A. Wilkins, Royal Greenwich Observatory, England, who should be contacted for relevant information.

THIRD INTERNATIONAL COLLOQUIUM ON MARS

The Jet Propulsion Laboratory and the California Institute of Technology will host the Third International Colloquium on Mars in Pasadena, California, from August 31 to September 2, 1981. Cosponsors are the National Aeronautics and Space Administration, the Lunar and Planetary Institute, and the Division for Planetary Sciences of the American Astronomical Society.

The first such colloquium was held in 1973 after the conclusion of the American and Russian Mars missions of 1971-1972, and the second was in 1979. The four-year acquisition of Mars data by the Viking mission has resulted in a large body of information that is being processed, analyzed, and interpreted by scientists around the world. This colloquium will provide an opportunity for planetary scientists to discuss their results and their ideas in the context of the major scientific questions about Mars.

Announcements will be sent to all scientists who are known to be active in planetary investigations. The organizing committee includes Arden L. Albee, Raymond E. Arvidson, Joseph M. Boyce, Donald L. Devincenzi, Fraser P. Fanale, Ronald Greeley, Garry E. Hunt, Thomas B. McCord, Robert E. Murphy, Roger J. Phillips, James B. Pollack, Conway W. Snyder, and Joseph Veverka. Abstracts will be due at the Lunar and Planetary Institute, Publications Office by 1 June 1981. Information on the agenda of the colloquium will be published in July.

Requests for further information should be addressed to Conway W. Snyder, Jet Propulsion Laboratory, Pasadena CA 91109.

VI ERMA

The topic of the Sixth European Regional Meeting in Astronomy (VI ERMA) will be *SUN AND PLANETARY SYSTEM*. This meeting, sponsored by the International Astronomical Union, International Union of Geodesy and Geophysics, and European Physical Society, organized by the Union of Societies of Mathematicians, Physicists and Astronomers of Yugoslavia, will be held in Dubrovnik, Yugoslavia, on October 19-23, 1981.

Four sections and their organizers are:

Section I Sun from the Astronomical and Physical Points of View: V.A. Krat, G. Marx, J.C. Pecker (main organizer)

Section II Astronomical, Geophysical and Geodetic Problems Related to the Earth; H. Kautzleben, J. Kovalevsky (main organizer), P. Melchior

Section III Physics of Planets, Comets, Minor Planets, Satellites, and Interplanetary Medium; H. Alfven, H. Haupt, Z. Kopal (main organizer)

Section IV Motions in the Planetary System; L. Kresak (main organizer) P.J. Message, G. Sitarski.

Special Session Workshop "Three-dimensional Refraction"; G. Teleki (main organizer), E. Tengstrom.

For additional information contact G. Teleki (or I. Pakvor or Z. Knezevic), Astronomical Observatory, Volgina 7, 11050 Belgrade, Yugoslavia.

McGETCHIN VOLCANO FUND: OPPORTUNITY FOR SUMMER STUDY

The McGetchin Volcano Fund has been established (1) to allow special projects in volcanology to be pursued by undergraduate or graduate students not involved in Ph.D. thesis research, and (2) to encourage McGetchin enthusiasm to be developed by active (field) participation in research.

Applications are invited for this first year's program of summer study. Applicants should submit or have sent (a) a brief description of the project, (b) a letter of evaluation of, and concurrence with the project, by a supervising sponsor from a research institution (e.g., faculty), (c) two letters of technical or scholastic reference, and (d) an up-to-date academic transcript and resume.

The project description should include such information as approach, significance, location, duration, and itemized budget of the support requested. The research relation between the student and sponsor should be defined. Topics in volcanology are non-restrictive but should emphasize participation. The proposal should be limited to no more than four pages. A report discussing the outcome or direction of the project will be required at the end of the project. Funding limitation for each project this summer is likely to be between $500 and $1000.

The above application material should be sent by March 16, 1981, to:

McGetchin Volcano Fund
Lunar and Planetary Institute
3303 NASA Road One
Houston TX 77058

Announcement of awards will be made by April 15, 1981.

Planetary scientists actively involved in volcanology are encouraged to suggest this opportunity to potential applicants. Depending on the success of the current fund-raising effort, it is hoped the McGetchin Volcano Study Program will be continued and expanded in the future

PUBLIC RESPONDS TO VIKING FUND

Early this year in a quiet ceremony at the National Air and Space Museum, a check for $60,000 was delivered to space program officials, the first installment in what the organizers of the *Viking Fund* hope will be an annual contribution of at least $100,000. The purpose is to keep the robot landed on Mars in the Viking I mission in the planetary information business.

The robot, which landed on the planet's surface on 20 July 1976, is still transmitting radiophotos and other information back to earth. However, it appeared early in 1980 that the receivers on Earth might have to be turned off due to tight budgets in the space program. Thus, the Viking Fund was established, taking a few words from NASA's charter from Congress which provides for private as well as government funding of space projects.

Contributions to the Viking Fund are being received by the American Astronautical Society, P.O. Box 7205, Menlo Park, CA 94025. Checks should be made out to the Viking Fund.

INSTITUTE TO STUDY HUMAN FACTORS IN SPACE EXPLORATION

The Institute for the Social Science Study of Space (ISSSS) is a nonprofit, tax-exempt, publicly supported institute devoted to the development of an objective, scholarly community of researchers and analysts concerned with the systematic investigation of the human factors involved in the exploration, industrialization and utilization of outer space. ISSSS seeks to coordinate and mobilize the social science and humanities knowledge and expertise which must accompany technical development of the space environment.

Affiliated with the Universities Space Research Association (a consortium of fifty-two universities active in space sciences research), ISSSS conducts research, promotes professionalism, acts as a clearinghouse for curriculum development materials and publishes selected documents in the space-related social sciences.

For more information about ISSSS, its publications and programs, write: Institute for the Social Science Study of Space, P.O. Box 922, Georgetown University, Washington DC 20057.

SCIENCE PLANS FOR VOYAGER 2 AT SATURN

Scientists are planning the objectives for Voyager 2's encounter this summer. Some of the plans include:

- Tracking F-ring features to increase understanding about the clumps within the ring.
- Three-dimensional images of portions of the F-ring to determine if the braided elements of the ring actually wind around each other or simply criss-cross one another within the same ring plane.
- Study of the eccentric rings to get information on why they are not circular.
- Observe the Saturn satellite, Enceladus, which is of particular interest because of its apparently smooth surface in comparison to other satellites in the Saturn system. Voyager 2 will pass much closer to Enceladus than Voyager 1.
- Use more wide angle imaging of the northern hemisphere of Saturn to bring out the atmospheric features on the planet.

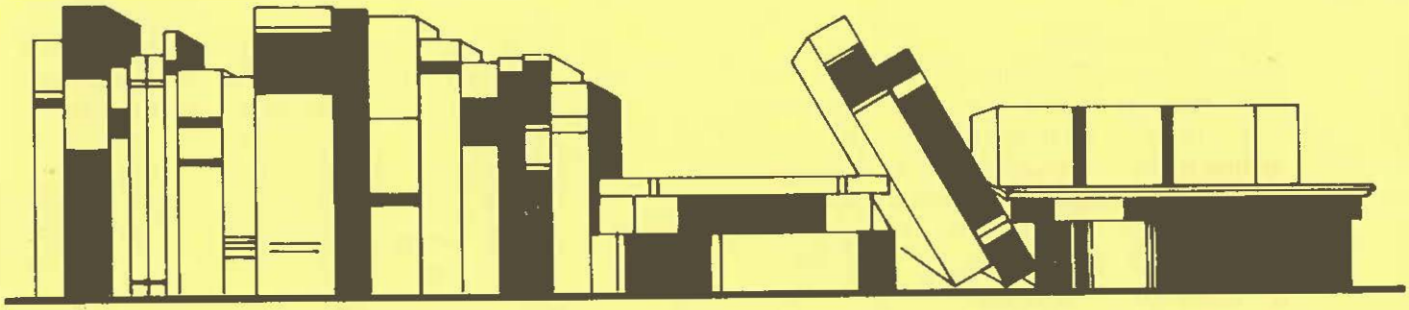
Voyager 2's closest encounter to Saturn will be on August 25, 1981.

NASA has officially approved the continuation of Voyager 2 on a trajectory which would take it to Uranus in 1986 after flying past Saturn this summer.

Under the approved plan, the spacecraft will encounter Uranus at a distance of 107,000 km (66,000 miles) January 24, 1986, making measurements and taking pictures as it speeds past and heads for a possible encounter with Neptune.

The Uranus encounter will provide the world with its first close-up look at the planet. Uranus is the seventh planet outward from the Sun, twice as far from the Sun as Saturn; it rotates on its axis at a tilt of 98 degrees. It is a grim, frozen world.

The decision to fly past Uranus is, in effect, a decision to retain the present trajectory. If agency officials had decided against a Uranus encounter, then a retargeting of the Voyager 2 would have been required.



NEW PUBLICATIONS

NASA PUBLICATIONS

The following publications are available from the Superintendent of Documents, Government Printing Office, Washington DC 20402. Although this agency requires prepayment on all orders, they will now acccept Master Charge or VISA credit cards. Just include the account number and expiration date on your order to them. *PLEASE* do not send orders for these publications to the LPI. We are not a distribution center for SOD documents.

Teacher's Guide for NF-58 Comparing the Planets. This is the companion volume and explanatory booklet for the chart of the solar system, NF-58, which was made available last year. For anyone who now has a copy of the chart, this booklet, written by Dr. Robert E. Murphy, Discipline Scientist, Planetary Atmospheres, NASA, provides a more in-depth discussion of the various parts of the chart and how the parts can be used for additional study of the solar system. The Teacher's Guide is available as S/N 033-000-00787-6 for $1.75. The wall chart is also still available as S/N 033-000-00744-2 for $2.25.

SPECIAL NOTICE *We have been informed that the set of Voyager posters listed in the December* Bulletin *is out of print. Please do not be TOO disappointed if your request for this poster set cannot be filled.*

OTHER PUBLICATIONS OF INTEREST

REMEMBER. . . please do not order any of the publications listed here from the LPI. Contact the source, publisher, or your local book seller if you wish to obtain a copy.

MT. ST. HELENS EDUCATIONAL SLIDE SETS. Slide sets of the eruptions and their effects have been prepared by A.J. Irving, University of Washington. Set #1 consists of 80 slides: 70 slides depicting all major aspects of the eruptions and their effects *plus* ten color graphics with descriptions. The slides include before and after views of the mountain, eruption column and active mudflows, views of the lava domes, flow deposits, ash deposits, and other descriptive views. The graphics include ashfall distribution maps, map of effects, earthquake and harmonic tremor periodicity, schematics of May 18 eruption, and map of Cascade Range, subduction section. Set #1 is priced at $85.00. Set #2 consists of 45 slides: 36 slides selected from Set #1 *plus* 9 color graphics (excludes map of Cascade Range). Set #2 is priced at $50.00. To order, send check or money order to A.J. Irving, P.O. Box 15162, Seattle, WA 98115. Include $1.00 for third-class postage; $2.00 first-class, and $3.00 overseas airmail.

Photographs from the Voyager/Saturn Encounter The Astronomical Society of the Pacific has announced the availability of sets of prints of Saturn, its rings, and its satellites, selected from the images returned by the Voyager spacecraft. Prints are 8 x 10 *photographic* prints (four in color, one in black-and-white in each set) carefully produced from originals provided by NASA's Jet Propulsion Laboratory.

The Prints include:
Saturn System Collage Full color dramatic 8x10 montage of the Saturn system, assembled from the best Voyager images of the planet and 5 of its satellites. $2.50 each
Print Set I: Saturn and its Rings 5 prints of Saturn and the ring system. $10.00 per set
Print Set II: Saturn and its Satellites 5 Prints of Saturn and close-ups of the satellites. $10.00 per set
For more information or to mail orders send check or money order including $1.50 handling and postage charge to: A.S.P., Saturn Order Dept, 1290 24th Ave., San Francisco CA 94122.

The Continental Crust and its Mineral Deposits edited by D.W. Strangway, Geological Association of Canada Special Paper No. 20, 1980. viii, 804 pp. Available from the G.A.C., Publications Division, 111 Peter Street, Suite 509, Toronto Ontario M5V 2H1 Canada. $30.00

The geological sciences changed their major focus in the 1950's from the continents to the oceans as a result of improved technology and the promise of solving some of the problems of crustal evolution. Perhaps in the same manner improved technology and the promise of solving some of the remaining problems of crustal evolution will change the major focus back to the complexities of the continents. A further incentive for this is the understanding of ore deposit implacement that characterizes the continental crust.

The present volume represents the focusing of the attention of many leading scientists, (geophysicists, geochemists, structural geologists, economic geologists, etc.) on the continental crust. It is the proceedings of a symposium held in honor of J. Tuzo Wilson at the University of Toronto in May, 1979. The 41 papers are grouped under six general headings. The first group, under the heading *The Early Earth* follows the earth through accretion, core formation to tectonics of the early crust. The second group examine origin and evolution of the Precambrian continental crust from several viewpoints. The third group deal with geophysical probing of continental crustal structure while a large fourth group concentrate on horizontal motions and their effects. A small (4 papers) fifth group examines *The Global View* of the crust as a whole. The final group examine many of the numerous ways in which continental crustal processes lead to ore deposits, particularly sulphides. The papers are generally lucid and well referenced and range from general studies to particular case histories.

As a compendium of current knowledge and ideas in many different fields concerning the continental crust, this volume should be of great value to all geoscientists.

Ye olde Editor's Note: If you know of any new materials which would be of interest to our readers, please send a copy or information about them to the Editor, this Bulletin. Review of items here does not constitute any endorsement of them by the Lunar and Planetary Institute.

The *LUNAR AND PLANETARY INFORMATION BULLETIN* is published by the Lunar and Planetary Institute. There are usually four issues per year. It is distributed free on request to lunar and planetary scientists, educators, students, and their institutions.

The next issue will be in June. Copy deadline is May 15, 1981. 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.

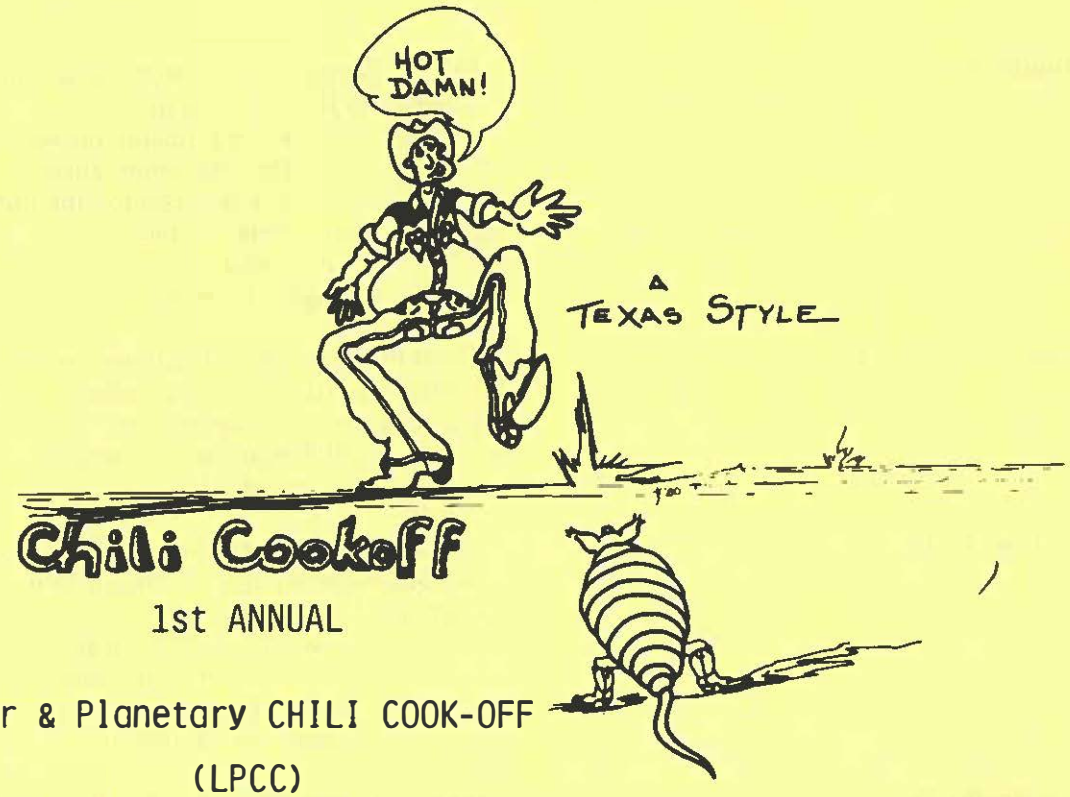
Editor: Frances B. Waranius,
Lunar and Planetary Institute
3303 NASA Road One, Houston, TX 77058
Phone: 713/486-2135

calendar

March 11-14	Comets, Ices, Grains and Plasma, Tucson AZ. Contact: Mildred S. Matthews Lunar and Planetary Laboratory University of Arizona Tucson AZ 85721 Telephone: 602/626-2902 or 4602
March 16-20	TWELFTH LUNAR AND PLANETARY SCIENCE CONF. Johnson Space Center, Houston TX. Contact: Ms. Pamela Jones LPI 713/486-2150
March 23-24	Space Comes of Age: Perspectives in the History of the Space Sciences, National Air and Space Museum, Washington DC. Contact: Rita Bobowski Public Affairs Officer National Air and Space Museum Washington DC 20560
March 23-April 4	NATO Advanced Study Institute on Early Evolution of Planets and Their Atmospheres, University of Newcastle upon Tyne, England. Contact: Mr. M. Walmsley Administrative Assistant School of Physics University of Newcastle upon Tyne Newcastle upon Tyne, England NE1 7RU
April 8-10	International Symposium on the Hellenic Arc and Trench, Athens, Greece Contact: Prof. S.S. Augustithis National Technical University Dept. of Mineralogy-Petrology-Geology P.O. Box 1006 Athens, Greece
April 14-16	Uranus and the Outer Solar System, University of Bath, Bath England. Contact: Dr. G. E. Hunt Laboratory for Planetary Atmospheres Dept. of Physics and Astronomy University College London Gower Street London WC1E 6BT England
April 20	DEADLINE XII Lunar and Planetary Science Conference Proceedings Manuscripts. Send to: Publications Office Lunar and Planetary Institute

May 18-21	Fifth Princeton Conference on Space Manufacturing, Princeton University, Princeton New Jersey Contact: Ms. Barbara Evans Space Studies Institute P.O. Box 82 Princeton NJ 08540 Telephone: 609/921-0377
May 22-27	International Astronomical Union Colloquium No. 63 "High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations" Grasse, France. Contact: Dr. O. Calame CERGA Av Nicolas Copernic 06130 GRASSE, France
May 25-29	American Geophysical Union Spring Annual Meeting Baltimore MD. Contact: AGU 2000 Florida Avenue NW Washington DC 20009
June 1	International Colloquium on Mars ABSTRACTS DEADLINE Send to: Publications Office Lunar and Planetary Institute
July 18-22	Fourth International Conference on Permafrost, University of Alaska, Fairbanks, Alaska Contact: Louis De Goes, Executive Secretary Polar Research Board National Academy of Sciences 2101 Constitution Ave. NW Washington DC 20418
August 10-14	Fourth International Conference on Basement Tectonics, Oslo Norway. Contact: Mr. Roy H. Gabrielsen Dept. of Geology University of Oslo P.O. Box 1047, Blindern Oslo 3, Norway
August 17-21	Meteoritical Society, 44th Annual Meeting, Bern, Switzerland. Contact: Prof. P. Eberhardt Physikalisches Institut University of Bern Sidlerstr. 5 3012 Bern, Switzerland

August 28-Sept. 9	IAVCEI Symposium on Arc Volcanism, Tokyo and Hakone, Japan. Contact: IAVCEI Symposium on Arc Volcanism Prof. Daisuke Shimozuru Earthquake Research Institute University of Tokyo Bunkyo-ku Tokyo 113 Japan
August 31-Sept. 2	Third International Colloquium on Mars, California Institute of Technology, Pasadena CA. Contact: Dr. Conway Snyder Jet Propulsion Laboratory Pasadena CA 91109
October 13-16	Division for Planetary Science, American Astronomical Society, Pittsburgh PA Contact: Dr. Bruce Hapke University of Pittsburgh Dept. of Earth and Planetary Science 321 Old Engineering Hall Pittsburgh PA 15260
October 19-23	Sixth European Regional Meeting in Astronomy, (VI ERMA), Dubrovnik, Yugoslavia. Contact: G. Teleki Astronomical Observatory Volgina 7 11050 Belgrade, Yugolsavia
November 2-6	International Conference on the Venus Environment, San Francisco Bay, Area, CA. Contact: Ms. Kathleen Thomas-Miller Conference Coordinator Mail Stop 245-7 NASA-Ames Research Center Moffett Field CA 94035
November 2-6	Geological Society of America Annual Meeting Cincinnati, Ohio Contact: GSA Headquarters 3300 Penrose Place Boulder CO 80301 Telephone: 303/447-2020
November 3-9	Remote Sensing of Arid and Semi-Arid Lands, Cairo, Egypt Contact: Dorothy M. Humphrey Environmental Res. Inst. of Michigan P.O. Box 8618 Ann Arbor MI 48107 Telephone: 313/994-1200, ext. 290



1st ANNUAL

Lunar & Planetary CHILI COOK-OFF

(LPCC)

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CHILI COOK-OFF & BAR-BE-QUE

Plans for the 1st Annual Lunar and Planetary Chili Cook-off and Bar-Be-que are shaping up just great. There will be 15-20 teams in the Chili competition cooking such well know varieties as:

Texas Crude (JSC-Flight Operations)
Rhode Island Red (Brown)
Stony Brook Sting (SUNY)
Venusian Chili (JPL)

along with a few varities less familiar to us Texas Chili-Heads such as:

Unequilibrated Ordinary Chili (Institute of Meteoritics)
Arizona Cool: A High Temperature Condensate (U. of Ariz.)
Chili-con fS_2 (U. of Mass.)
Fremdlinge (Max Planck Inst.)
Good Old Aromas of Tenn.* (U. of Tenn.)
*(Guess their secret ingredient)
Hydraulically Actuated Solid Medium High Pressure Chili (JPL)

Chili cooking (and tasting) will be after the Wednesday Session (March 18), and will be held on the grounds at the LPI. A distinguished panel of judges, including a world's champion from the Terlingua contest (Buzzard's Breath Chili), will select the winners around 7 o'clock, after which the Bar-be-que will begin.
Cost of the entire affair including chili, bar-be-que (two meats, potato salad or cole slaw, beans and all the trimmings) and all the beer you can drink will be around $10.00. Tickets will be available at the Conference, so get your tickets early, and make your plans now to attend.

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