Lunar and Planetary Information
BULLETIN

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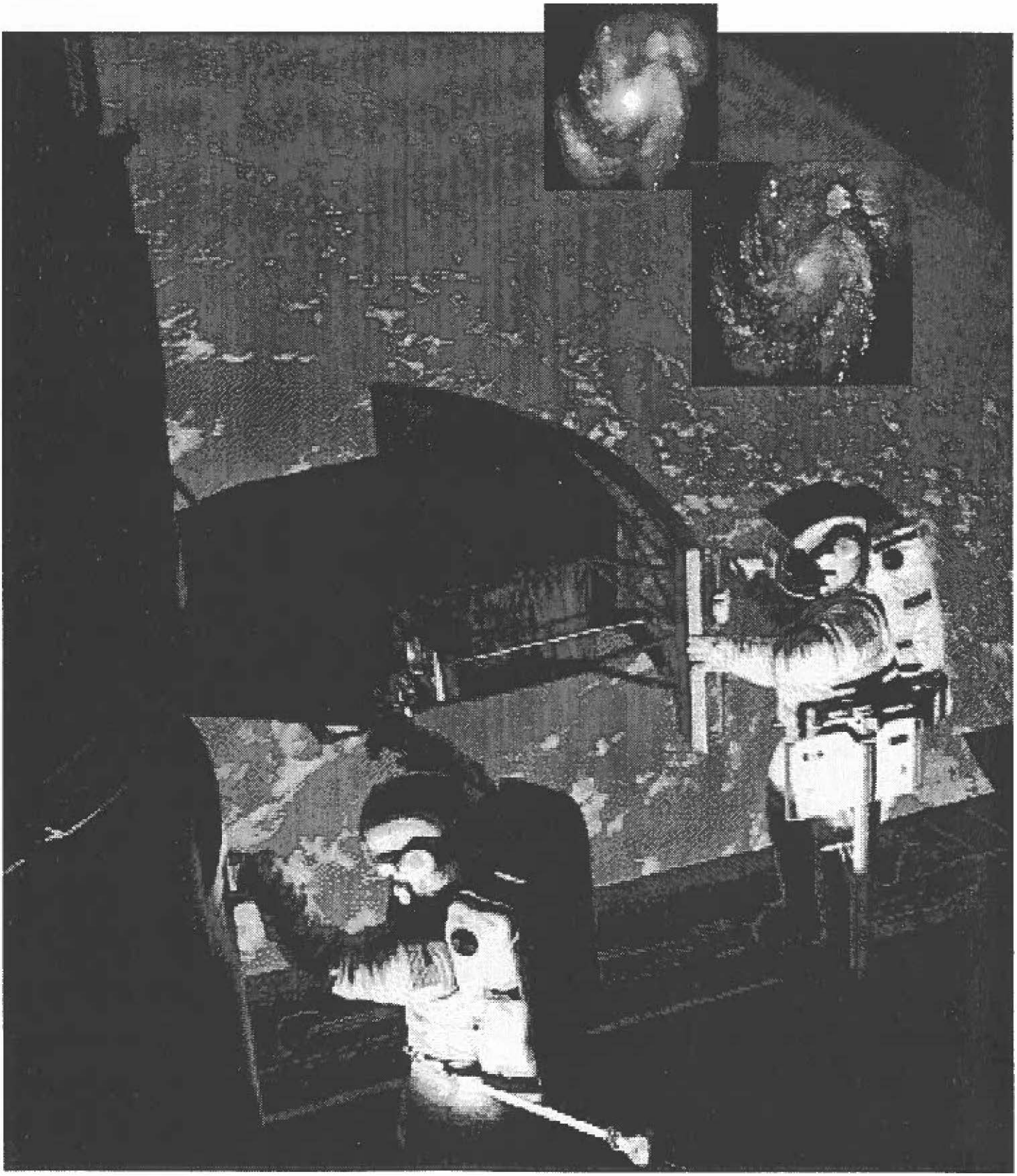


The 25th Annual Lunar and Planetary Science Conference will be held March 14–18, 1994, in Houston, Texas. The conference will begin with a reception and registration Sunday, March 13, from 6:00–9:00 p.m. Sessions will be held at the NASA Johnson Space Center (JSC) and the Lunar and Planetary Institute (LPI) beginning at 8:30 a.m. on Monday, March 14, and ending Friday, March 18, at noon.

CONFERENCE PROGRAM

Technical Sessions

Technical sessions will be held at the Gilruth Center. Parallel sessions will be held in Room A (Room 104), Room B (the old Gym), Room C (the new Gym), and Room D (upstairs, Room 206). The preliminary program and first paragraph of the abstracts accepted for the conference are available on line. Instructions for accessing this online information are included in this *Bulletin*.

Poster Presentations

Poster sessions have been scheduled for Tuesday and Thursday evenings from 6:30 to 9:30 at the LPI. Authors of papers selected and scheduled for poster presentations are asked to be available to display and discuss their results in the poster area during the assigned session. Additionally, posters may be viewed at LPI each day of the conference. Shuttle transportation between the Gilruth Center and LPI will be available throughout the week. Each poster will have a space 44" × 44" for display. Requests for tables, computers, or video equipment, etc., cannot be honored due to the limited space available for poster displays.

Visual Aids

Standard support for dual screen projection of slides and overheads will be provided in all technical sessions. A slide preview area will be available at the Gilruth Center. VCR images can be projected in Conference Rooms A, B, and C. In Conference Room D, a large-screen video monitor will be available. VCR tapes must be 1/2" VHS or 3/4" U/matic. Authors presenting by poster who want to show VCR tapes may sign up for one-hour slots on a first-come, first-served basis in Room 204 of the Gilruth Center. A tape player and monitor will be available in that room for video presentations. You may want to advertise the times your video will be presented on your poster board during the Tuesday or Thursday evening session.

SPECIAL SESSIONS

The Planet Mercury

A special session entitled "Mercury: Ground-based and Space-based Exploration" has been scheduled for Wednesday afternoon to highlight both recent scientific results of research and studies for the Discovery mission. The session will begin with a 30-minute overview talk by Dr. W. Smyth entitled "The Status of Mercury Exploration" followed by presentations submitted for this special session.

Special Poster/Display Sessions on Education

Two special poster/display sessions on education will be held at LPI on the Tuesday and Thursday evenings during the regular technical poster sessions, *instead of* an oral session at Gilruth. The education special presentations will be in and around the LPI Center for Information and Research Services (library) to display and demonstrate the programs and products that have been developed. This format will provide much more interactivity, which participants felt was lacking at the oral session, and will allow participants to do some of the "hands-on" projects rather than describe them orally. Computer software, videos, hand-outs, etc., may be included as part of the presentations. Presenters should contact the LPI library staff at 713-486-2182 concerning space allocation and equipment requests.

Dedicated Sessions

Three of this year's technical sessions are dedicated to scientists who died since we last met at the LPSC; each of these men made significant contributions to lunar and planetary science. The members of our community being honored in this manner are Roger Burns, Ted Ringwood, and Hans Suess.

SPECIAL EVENTS

25th Anniversary Celebration at Space Center Houston

A reception will be held at the new Space Center Houston to celebrate the twenty-fifth year of the LPSC. All exhibits and displays as well as the IMAX theater will be open at no charge to badged conference participants on Monday evening, March 14, from 8:00 to 10:30. A dessert and coffee buffet will be served. Guests may purchase tickets for $15.

Chili Cookoff and Barbecue Dinner

What would a celebration year of LPSC be without this traditional event? A team of original conference attendees making a "Hot for Rocks Chili" is just what this event needs. The cookoff and barbecue will be held on Wednesday from 6:30 to 9:30 p.m. at the Landolt Pavilion. Out-of-town teams are encouraged to enter. Because the conference staff can no longer provide cooking equipment, the "preparation on site" rule common to most cookoffs will be waived to encourage more team participation. The goal of this event is fun, not serious cooking competition. Guests may purchase tickets for $10.

Reception for Award Winners

A reception will be hosted by GSA on Monday at 5:00 p.m. in Conference Room A. The 1993 winner of the Stephen E. Dwornik Student Paper Award and the winner of the 1993 G. K. Gilbert Award will be presented to the LPSC participants at this reception.

Computer Demonstrations and E-Mail Stations

All computer stations for demonstrations, displays, exhibits, and e-mail will be located at the LPI. The main displays will be located in the Center for Information and Research Services (library). Several stations will be available to participants for checking electronic mail. The conference shuttle buses will make regular stops at LPI during each day of the conference.

REGISTRATION

The Sunday night reception and registration will take place at the LPI at 3600 Bay Area Boulevard from 6:00 to 9:00 p.m. Shuttle buses will operate from selected hotels to the LPI on Sunday night; they will also make hourly stops there during the week. Computer displays, exhibits, poster sessions, and other conference-related events will be located at the LPI throughout conference week. For those driving rental cars, see the information on overflow parking under "Conference Shuttle Services."

Registration will continue Monday through Thursday from 8:00 a.m. to 5:00 p.m. and on Friday from 8:00 a.m. to 12:00 noon at the Gilruth Center.

CONFERENCE SHUTTLE SERVICES

Conference shuttle buses will provide service between selected hotels (Nassau Bay Hilton, Days Inn, Holiday Inn, Ramada Kings Inn, Quality Inn, Motel 6, and Best Western NASA Inn), the JSC Gilruth Center, and LPI during lunch, at the close of sessions, and during special events. Your conference badge will serve as your bus ticket.

In addition, for those driving rental cars, we will provide a "park and ride" service for the registration on Sunday or the poster sessions on Tuesday and Thursday. If you arrive after the LPI parking lot has been filled, you may park in a lot at the University of Houston–Clear Lake (our next-door neighbor). Shuttle buses will pick you up at this lot and deliver you to the front door of LPI.

MESSAGES AND FAXES

A message center will be established in the registration area in the Gilruth Center during the technical sessions. People who need to contact attendees during the conference may call 713-483-0321. The message center will be open Monday through Thursday from 8:00 a.m. to 5:00 p.m., and on Friday from 8:00 a.m. until noon. A fax machine will be located at the staff desk *for incoming messages only:* the fax number is 713-483-5832. Telephone messages and faxes will be posted on a bulletin board near the Registration Desk.

Please contact the LPI Publications and Program Services Department at 713-486-2166 for further information about conference logistics.

DEDICATED SESSIONS

Roger G. Burns

The session "Mars Remote Sensing and Surface Composition" at the 25th LPSC is dedicated to the memory of Roger G. Burns, who succumbed to cancer in January. Roger was a pioneer in the development of mineralogic spectroscopy, and his book *Mineralogic Applications of Crystal Field Theory* (revised and updated in 1993) remains the classic, influential text in the field. More than half the papers being presented in this session alone utilize skills and concepts that can be directly traced to Roger's research.

At MIT he took an active role teaching mineralogy and geochemistry and was highly regarded by fellow faculty and the more than 30 M.S. and Ph.D. students whom he advised. As well, he was a mentor to most of the currently active researchers in planetary remote sensing. His research interests ranged from studies of the compositions of lunar and planetary interiors and SNC and other meteorites, planetary surface weathering, seafloor minerals, natural and synthetic gems, nuclear waste containment, and high-P variations in mineral structures.

His most recent research on the rates of oxidative weathering on Mars and the implications for possible past climate change represents an elegant synthesis of theoretical and observational chemistry, mineralogy, and spectroscopy that underscored his expertise and mastery of many diverse aspects of Earth and planetary sciences. While most of his career focused on understanding the major rock-forming minerals, Roger also had a special place in his heart for the "exotics." For example, his abstract in this year's LPSC volume deals with schwertmannite, and he has also written detailed papers on babingtonite and feroxyhyte. Many who worked closely with him in the Mars remote sensing community will forever associate his name with jarosite and his championing of the occurrence of gossans and ore bodies on the red planet.

All who knew Roger will sorely miss his keen intellect, gentlemanly charm, and unselfish enthusiasm for the Earth and planetary sciences. *—Jim Bell*

A. E. (Ted) Ringwood

The session "Planetary Differentiation and Processes" is dedicated to A. E. (Ted) Ringwood, who passed away on December 27, 1993. With his passing, planetary science lost one of its most vigorous members. Ted's interests were legion and his contributions are impossible to summarize in a comprehensive manner.

Suffice it to note that he made significant contributions to determining the bulk compositions of the terrestrial planets; to the formation of the Earth's core and to prosecuting the hypothesis that oxygen is

25th LPSC SESSION GUIDE

March 14–18, 1994

Monday Morning, 8:30 a.m.
- Venus Gravity and Interior Processes
- Origins of Planetary Systems: Session Dedicated to the Memory of Hans Suess
- Asteroidal and Planetary Basalts

Monday Afternoon, 1:30 p.m.
- Venus Tectonism
- Lunar Geology and Global Evolution
- Refractory Inclusions

Monday Afternoon, 5:00 p.m.
Reception hosted by GSA to honor the 1993 Stephen E. Dwornik Student Paper Award and the 1993 G. K. Gilbert Award Winner

Monday Evening, 8:00–10:30 p.m.
Space Center Houston 25th LPSC Anniversary Celebration

Tuesday Morning, 8:30 a.m.
- Planetary Volcanism: Venus and Earth
- Outer Solar System
- Isotope Anomalies, Nebular Processes, and Timescales
- Lunar Regolith: Processes and Products

Tuesday Afternoon, 1:30 p.m.
- Venus Surface Properties and Resurfacing
- Things That Go Bump in the Night: Shoemaker-Levy 9

Tuesday Afternoon, 3:30 p.m.
- Metal-Rich Meteorites
- Interstellar Grains and Astrophysical Settings
- Moon Rocks, Mostly Highland

Tuesday Evening, 5:30 p.m.
NASA Program Managers' Meeting

LPI, Tuesday Evening, 6:30–9:30 p.m.
- Poster Session I
- Education Session Displays—Integrating Planetary Science Into the Curriculum

Wednesday Morning, 8:30 a.m.
- Interplanetary Dust Particles
- Lunar Remote Sensing and Remote Sensing Techniques
- Ordinary Chondrites

Wednesday Afternoon, 1:30 p.m.
- Martian Geomorphology
- Planetary Differentiation and Processes: Session Dedicated to the Memory of Ted Ringwood
- Special Session "Mercury: Ground-based and Space-based Exploration"
- Solar and Cosmogenic Components

Wednesday Evening, 6:30–9:30 p.m.
Conference Social, Landolt Pavilion

Thursday Morning, 8:30 a.m.
- Mars Remote Sensing and Surface Composition: Session Dedicated to the Memory of Roger G. Burns
- Terrestrial Impacts: Holes from Beyond
- Chondrules
- Dimensionally Challenged Objects: Gaspra, Ida, Comets, and IDPs

Thursday Afternoon, 1:30 p.m.
- Asteroids
- Impact Experimentation and Theory: Guns and Coders
- Primitive and Differentiated Achondrites
- Mars and Venus: Atmospheres, Dust, and Weathering

LPI, Thursday Evening, 6:30–9:30 p.m.
- Poster Session II
- Education Session Displays—Integrating Planetary Science Into the Curriculum

Friday Morning, 8:30 a.m.
- Martian Geophysics and Impact Processes
- Impact Materials: Shock Geotherapy
- Carbonaceous Chondrites, Enstatite Chondrites, and Kaidun

one of the principal light elements in it; to the dynamics of the Earth, particularly to the question of whether subducting slabs penetrate into the lower mantle or remain suspended around the 70-km discontinuity as "megaliths"; to the mechanisms of formation of midocean ridge basalts; to the mechanisms of formation of lunar mare basalts; and to the origin of the Moon.

During the period 1978–1983, he directed the Research School of Earth Sciences at the Australian National University and helped bring it to its present distinction. He also applied his knowledge of mineral synthesis and elemental partitioning to major societal questions such as the disposition of radioactive waste through his SYNROC concept. For this prolific research Ted received recognition and international awards too numerous to mention. Ted was a ferocious prosecutor of his views, one who elicited strong reactions from his colleagues, and many of us recall vigorous debates at LPSC and other conferences. But, above all, Ted challenged his colleagues and stimulated significant accomplishments in others. Thus, his legacy is more than the sum of his own accomplishments. He will be missed.

— Mike Drake

Hans E. Suess

The session "Origins of Planetary Systems" is dedicated to Hans E. Suess, born in 1909 in Vienna, Austria, who died September 20, 1993, at the age of 83 in La Jolla, California.

From 1950 to 1955, as a research associate in radiochemistry at the Institute for Nuclear Studies in Chicago, he met Enrico Fermi, Harold Urey, Willard Libby, and Joseph and Maria Mayer. Working independently and simultaneously with Maria Mayer, Suess found an explanation for the periodicities in specific neutron and proton numbers that became known as the "magic numbers." Using them, Hans Jensen helped Suess with a completely new principle in nuclear physics, that of a spin-orbit coupling (for which Mayer and Jensen shared the 1950 Nobel Prize in physics). Suess' work contributed to the development of the shell model of the atomic nucleus.

NEW & IMPROVED ONLINE SERVICE FOR LPSC PROGRAM AND ABSTRACTS

The LPI will put the 25th LPSC program and abstracts on line on February 4, 1994, so that participants and others can access the information. After the meeting, the papers will be archived in an electronic database of information in planetary sciences.

In an effort to better serve the needs of the scientific community by increasing the speed, ease, and efficiency of online services, they are now being offered on a SUN computer that can be accessed through either an X Window interface or DEC/VT character-based terminals (e.g., VT100, VT102, VT220, VT240, VT330, VT340) and ANSI terminals.

X WINDOW INTERFACE

To access the online services via an X Window interface, perform the following steps:

From an x-term window (if you are using a SUN workstation you may use a cmdtool window) **telnet** to **cass.jsc.nasa.gov**. At the **login:** prompt, type **cass** (you *must* use lowercase letters for login). At the **password:** prompt, type **online**.

In order for the X Window interface to work on your computer, you must know your display address.

CHARACTER-BASED TERMINAL

If you are using a character-based terminal to access the online service via Internet, type **telnet cass.jsc.nasa.gov** or **telnet 192.101.147.17**.

To access the service via DECNET (if your host does not support telnet), type **set host east**. You will receive the Ultrix login prompt:

ULTRIX 4.0 (Rev. 179)
east.gsfc.nasa.gov
login: cass.jsc.nasa.gov!

Type in the response shown above (do not forget the exclamation point!).

To access online service via direct dial, phone 713-244-2089 to connect to 19,200/9600/2400/1200 baud.

For all three methods of access, at the **login:** prompt, type **cass** (you *must* use lowercase letters for login). At the **password:** prompt, type **online**.

INFORMATION FOR NEW USERS

Once you have logged on, ***please read the Information for New Users on the first screen.***

If you are using a character-based terminal, you will use the following key commands for navigating the online services.

Ctrl R	Menu bar (toggle)
Ctrl F	Next page
Ctrl B	Previous page
Tab	Next field
Ctrl N	Next field
Ctrl P	Previous field
Ctrl]	Scroll left (pan left)
Ctrl \	Scroll right (pan right)

To access 25th LPSC online material, choose "Activities" from the main menu bar. You will see a list of resources available. Choose "Meetings" to display the list of LPI-sponsored meetings. Then choose "25th LPSC" for browsing, searching, or downloading the program and abstracts for the Lunar and Planetary Science Conference.

OVERLAP WITH OLD ONLINE SERVICE FOR A LIMITED TIME

The 25th LPSC program and abstracts will continue to be accessible this year via the VAX-based system used in previous years. This system will be phased out as all online services are transferred to the SUN later this year. The program and abstracts will be accessible electronically on February 4 via the NASA Science Internet (NSI) or by direct dial.

- On NSI/DECNET (SPAN), type **set host lpi**.
- On NSI/Internet, type **telnet lpi.jsc.nasa.gov** or **telnet 192.101.147.11**.
- To dial direct, call 713-244-2090 or 713-244-2091. These modem numbers will connect to 2400 or 1200 baud.

For all three methods of access, respond to **Username: LPI**. No password is necessary. Choose "LPSC Conference Program" from the menu.

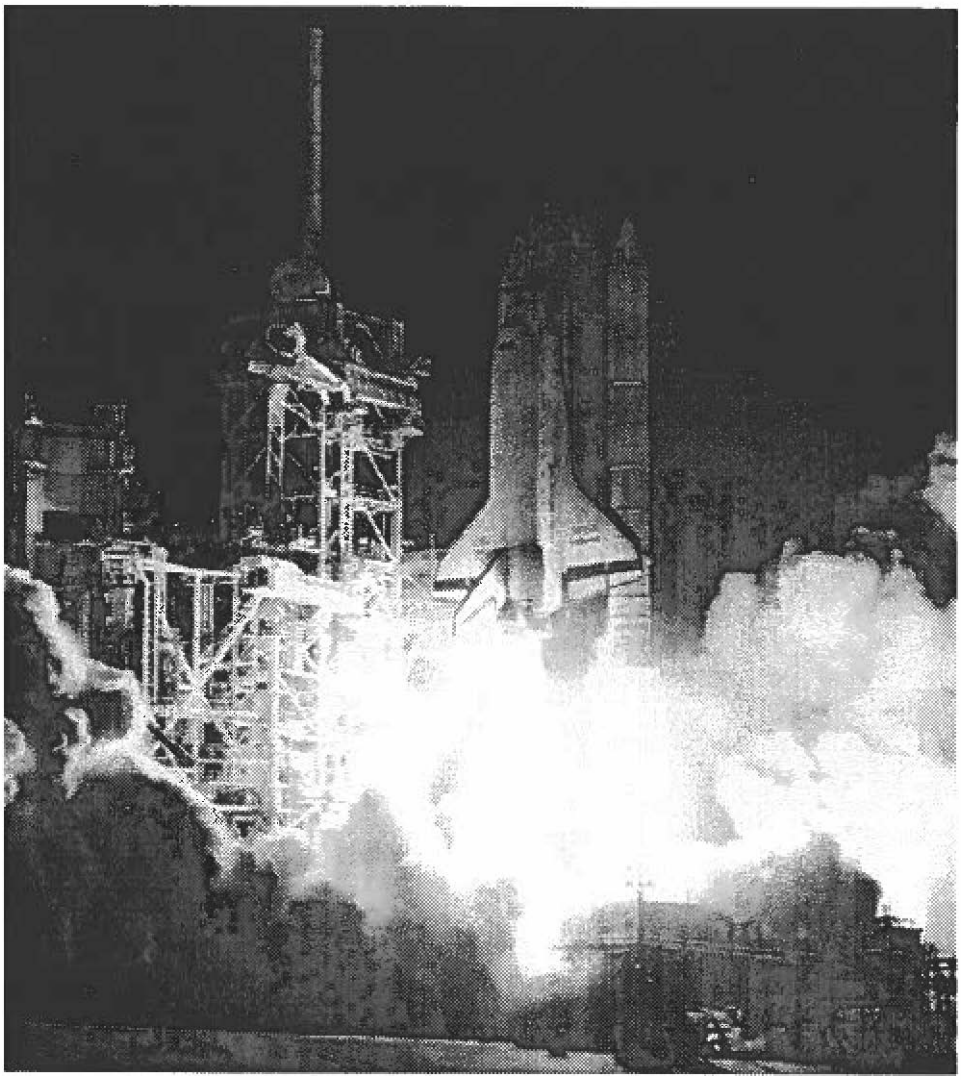
GETTING HELP

If you have difficulty in accessing the LPI computer, please contact Eleta Malewitz at 713-486-2197 (e-mail: malewitz@lpi.jsc.nasa.gov) or Sarah Enticknap at 713-486-2164 (e-mail: enticknap@lpi.jsc.nasa.gov).

In 1955 Suess established the La Jolla Radiocarbon Laboratory at the Scripps Institution of Oceanography. Here he described how the abundance of elements and their isotopes reflected nuclear and cosmic properties. Suess' paper on "Abundances of the Elements," written with Harold Urey, is considered one of the most influential contributions to cosmochemistry and provided the basis for theories on element synthesis and the origin of the solar system.

Suess' paper with Roger Revelle in 1957 on the carbon cycle was critical in calling attention to the dangers of global warming. The accurate tree-ring calibration curve for carbon 14, developed in his laboratory, formed the basis for carbon 14 dating, and was a breakthrough that led to a revolution in archeology. Radiocarbon dating is still used today in anthropology, archaeology, geophysics, and astrophysics.

—Kurt Marti



"The Trouble With Hubble is Over"

With these words, Senator Barbara Mikulski (D-Md.) exultantly declared the Hubble Space Telescope repairs an unmitigated success. Senator Mikulski, chairman of the VA, HUD and Independent Agencies appropriations subcommittee, and NASA Administrator Daniel Goldin unveiled new images from the telescope that showed dramatic proof that Earth-based engineers and space-walking astronauts had achieved the difficult goal of restoring Hubble's optics to specification or better.

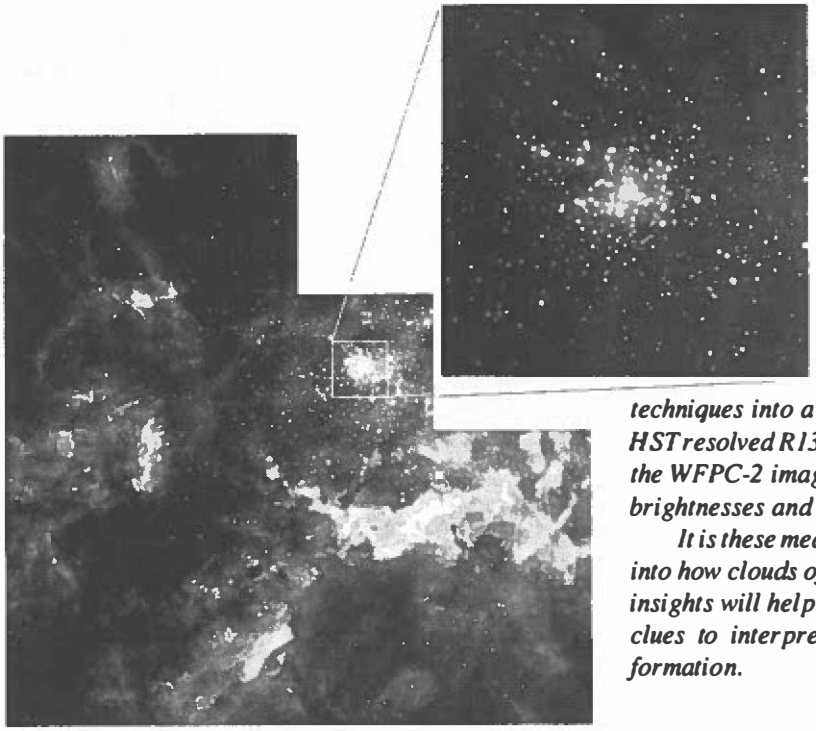
During the first week of December, astronauts Story Musgrave, Jeff Hoffman, Kathy Thornton, and Tom Akers performed the most EVA-intensive shuttle mission yet, with strong support from Commander Dick Covey, Pilot Ken Bowersox, and ESA astronaut Claude Nicollier. Alternating teams of two astronauts on five successive nights replaced the original Wide Field Planetary Camera (WFPC) with a redesigned and upgraded WFPC-2 and installed the Corrective Optics Space Telescope Axial Replacement, or Costar, to correct for spherical aberration for the Faint Object Camera, High Resolution Spectrograph, and Faint Object Spectrograph.

In addition, the astronauts replaced the telescope's solar panels with a better-insulated pair to reduce jitter caused by heating and cooling of the arrays as the spacecraft passes from sunlight to shadow in its orbit. Replacements for failed gyros, computer memory upgrades, and improved magnetometers and electrical packages were also installed during the intricately choreographed spacewalks.

Checkout and precision focusing of JPL's WFPC-2 and Goddard/Ball Corporation's Costar were accomplished more quickly than anticipated, allowing NASA to release images from the two instruments at a January 13 press briefing. Scientists at the briefing were clearly elated. "It's fixed beyond our wildest expectations," enthused Ed Weiler, Hubble Chief Scientist. The pre-repair telescope could only focus about 12% of incident light into a central image area because of spherical aberration; specifications for the corrective optics required an improvement to 60%. Although calibrations are not yet complete , scientists are confident that Hubble is now able to focus more than 70% of the light into the central area.

"This is very near the physical limit of what a telescope the size of Hubble can do," declared John Trauger, WFPC-2 Chief Scientist. The Costar team leader, Jim Crocker, said that the corrective optics have produced a result "as perfect as engineering can achieve and the laws of physics will allow."

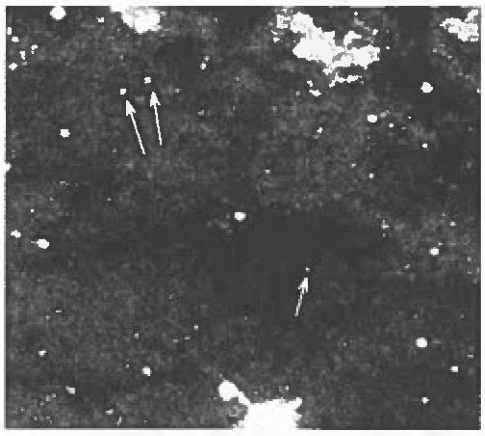
Astronomers can look forward to achieving some of the scientific goals for which the Hubble was conceived. Among them are the more precise determination of the Hubble constant that describes the rate of expansion of the universe. The telescope should be able to resolve many more distant "special" stars, such as the Cepheid variables, that are used as measuring sticks of the precise distance of galaxies. The search for conclusive evidence of planetary systems around other systems will be renewed, and the long-awaited look back in time—perhaps as far as 10 billion years—may finally be achieved.

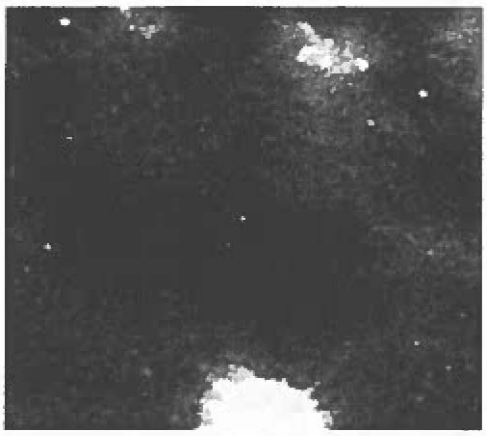


R136 in 30 Doradus—The chevron-shaped picture is a mosaic taken with WFPC-2's four cameras of part of the giant cloud of gas and dust in 30 Doradus in the Large Magellanic Cloud 160,000 light years away. The inset is a blowup of the dense star cluster R136, where hundreds of hot stars ionize the surrounding hydrogen.

Even at the distance to 30 Doradus, WFPC-2's resolution allows objects as small as 25 light days across to be distinguished, revealing the effect of the hot stars on the surrounding gas in unprecedented detail. Once thought to consist of a fairly small number of supermassive stars, R136 was resolved from the ground using speckle techniques into a handful of central objects. Prior to the servicing mission, HST resolved R136 into several hundred stars. Now, preliminary analysis of the WFPC-2 images shows that R136 consists of more than 3000 stars with brightnesses and colors that can be accurately measured.

It is these measurements that will provide astronomers with new insights into how clouds of gas suddenly turn into large aggregations of stars. These insights will help us understand how our own galaxy formed and will offer clues to interpreting observations of distant galaxies in the process of formation.





Galaxy M100 Resolution Comparison—(Left) An outer region in the galaxy M100 imaged by the WFPC-2. The image demonstrates one of the most important improvements in the telescope's capabilities—the ability to detect and measure light from individual faint stars in distant galaxies. The stars indicated by arrows in the WFPC-2 image have the approximate brightness expected for Cepheid variables in M100. While these specific stars may not turn out to be Cepheids, repeated measurements of hundreds of stars of similar brightness throughout the galaxy are expected to turn up several dozens of Cepheids. By accurately measuring the brightness of these "standard candles," astronomers can more accurately determine the distance to M100. Determining accurate distances to many galaxies is crucial to refining the Hubble constant, which describes the rate of expansion of the universe, thus, its age and its size.

(Upper right) WFPC-1 image of the same region as left image. The faint stars used for estimating the distance of the galaxy are not visible because spherical aberration smears out the light rather than concentrating in the central image area.

(Right) Groundbased image of the same area from Palomar 5 m on a night with good seeing.

Successful Launch for Clementine

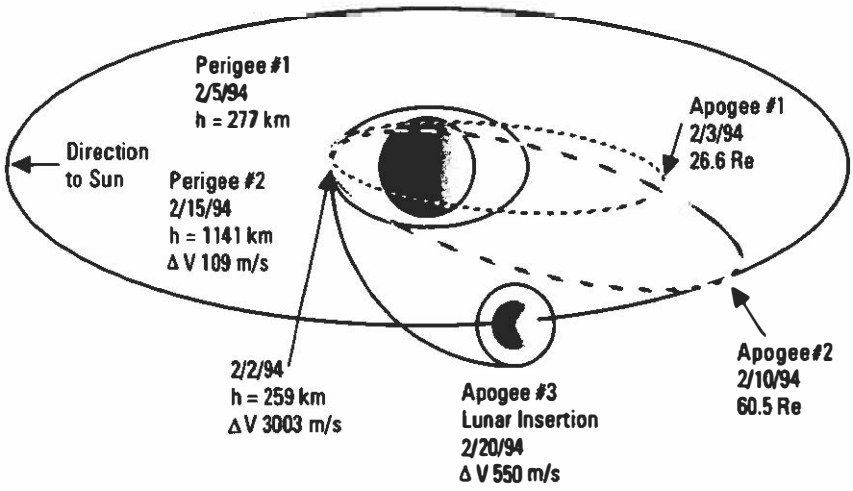
The Clementine Mission, also known as the Deep Space Program Science Experiment, was launched from Vandenberg Air Force Base on January 25. A joint mission of the Department of Defense and NASA, Clementine will visit the Moon and the asteroid Geographos to test the small spacecraft, subsystems, and sensors in deep space and to return a suite of scientific data from the two bodies.

Paul Spudis, Deputy Team Leader of the Clementine Science Team, witnessed the launch of the Clementine spacecraft atop a Titan IIG rocket and offered this account.

"The Clementine spacecraft left Vandenberg Air Force Base at about 0834 on Tuesday, January 25, 1994. The previous day, the weather had caused some concern, with low ceiling, rain, and fog. As we anxiously waited for the weather to clear, the decision was made to roll back the launch gantry about four hours before launch (at about 4:00 a.m. local time). At that time, the weather was still questionable (light rain showers), but it cleared as the sun came up.

We made our way to Wall Beach, at the shoreline about two miles from the pad (SLC-4W), at about 0800. A moderately high wind had whipped up the sea into a truly awesome display: crashing surf, whitecaps out several hundred yards into the sea, all accompanied by a moderately brisk wind (I estimate about 10–15 knots).

At T minus 12 minutes, a hold in the count took place, caused by alleged high-altitude wind shear. We found out later that this was a result of some weather models that turned out (upon obtaining real data from Doppler weather radar) to be false. The count was picked up after a few minutes (the total hold duration was only about 11 minutes—it seemed much longer). The count continued, with another small hold at about T minus 3 minutes. When the count resumed, the first minute of those last three minutes of countdown seemed to last an eternity, but the actual last two minutes seemed to fly by.



The ignition and liftoff were upon us before we knew it, and the booster slowly and majestically lifted off into a clear blue sky. Booster noise finally reached our viewing area and sounded like a very gentle, low rumble. We were able to track the vehicle all the way through staging, when the rocket was finally lost to view in the rising sun.

Clementine is now in low Earth orbit (140 by 160 nanometers; 67° inclination), and will leave for the Moon on February 2. Spacecraft systems are performing well and the Team looks forward to getting an abundance of new, high-quality data from the Moon and Geographos."

In addition to testing Department of Defense (DoD) sensors and subsystems in deep space, the mission will provide an abundance of scientific data about the surface morphology, topography, and composition of both the Moon and Geographos, providing an insight to processes that have shaped their history. The innovative instruments and sensors employed will also permit a first-order global assessment of lunar resources upon which future missions to the Moon can build.

Clementine begins the task of building the first global digital image model of the Moon ever. Improved coverage and resolution will allow more detailed geologic mapping than any previous lunar observations. While the Galileo spacecraft provided spectacular multispectral images of the lunar surface, Clementine offers many significant advances. Pixel resolution will be at least 10 times better than Galileo's, and the High Resolution Camera images offers up to 100 times better resolution, providing improved unit mapping. Using a variety of sensors and filters developed for DoD applications, Clementine will provide improved spectral coverage (up to 2.8 micrometers) of the lunar surface. Altimetry from the laser ranger will provide topographic profiles for the midlatitudes. Maps based on the wealth of data will enable studies of regional history and permit the processes of volcanism, tectonism, and impacts that have shaped lunar history to be deciphered.

The combined UV/VIS and NIR camera images will contribute to a global color map that can be used to interpret rock types and estimate distribution of lunar resources.

Science objectives for the asteroid flyby are exploration and mapping. Geographos is the first near-Earth asteroid that has ever been investigated close up. Scientists hope to determine its volume and shape and how it spins as well as its approximate composition and the properties of its regolith. Clementine data will help to set the stage for the upcoming Near Earth Asteroid Rendezvous (NEAR) Discovery mission. ☌

NEW IN PRINT

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

REVIEWS

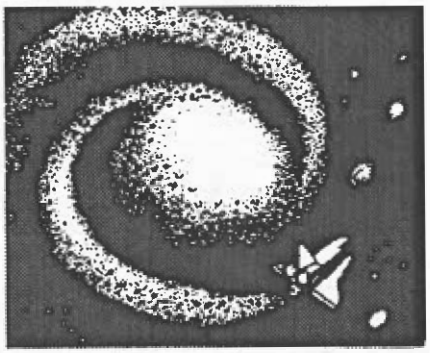
EVERYDAY WONDERS—Encounters with the Astonishing World Around Us
by Barry Evans
Contemporary Books, Chicago, 1993, 363 pp.
Black and white photographs and illustrations. Softcover. $14.95

WHY NOTHING CAN TRAVEL FASTER THAN LIGHT—and Other Explorations in Nature's Curiosity Shop
by Barry E. Zimmerman and David J. Zimmerman
Contemporary Books, Chicago, 1993, 309 pp.
Black and white illustrations. Softcover. $12.95

—by Stephen Tellier

These are two recent additions to the "popular science" genre of books. They consist of essays (mostly short) in everyday language on a variety of topics of a scientific nature. The discussions are not just about the unique or curious but deal with some of the fundamental principles of nature. They point out how these principles are demonstrated in our everyday lives and how things would be different if these forces worked in another way or did not exist at all. Also discussed are how new discoveries and insights have changed our understanding of the world we live in and how they may change our lives in the future.

Topics range from the operation of the universe as a whole down to the quantum mechanics of subatomic particles. These phenomena are very different in scale physically but equal in their effect on us and their ability to excite the imagination. The books are written by authors who write about science for a living and are easy to read. The material includes several "hot" topics and the information is very recent.



Why Nothing Can Travel Faster than Light. . . is more conversational in format and tone—almost as if you had asked a friend you knew was knowledgeable on a topic to give you a quick overview of the subject, touching on its more interesting aspects and implications. The essays place the ideas in context and provide some historical background. Those a little more familiar with some of the topics might take issue with some statements made as accepted fact. But, for the most part, the essays acknowledge the existence of other points of view and identify speculation.

These speculations would seem to be intended to stimulate the reader to pursue the subject further. However, this effort is hampered by the fact that sources are not well identified, either in the text or in a reading list of some kind. On the plus side, the book has a rather extensive index, which can increase the usability of any book.

Everyday Wonders is a more technical book in the sense that it includes more facts and figures and some mathematics. On the other hand, it is more whimsical in presentation and style of writing. Evans evidently is attempting to emulate author Martin Gardner, to whom the book is dedicated, by employing amusing stories involving the reader to ease the understanding of a difficult concept. Many readers may find, as I did, his stories a bit too much and somewhat distracting. The use of puzzles, however, does involve the reader more as do the interviews, or "conversations," with several of the world's most famous scientists. Illustrations, a glossary of technical terms, and appendixes also help with the more technical discussions. This

Francis Crick

book does have a bibliography that includes a number of classic works of popular science, which are sure to be of interest to readers of this one.

Both of these books make for interesting reading and are pretty typical representatives of the genre. The books cover similar topics, which are well chosen. Many discussions cover questions I have been asked in my current job in a research center as well as when I was teaching science. The Zimmermans' book is a bit more readable in terms of writing style and might better serve someone just starting to explore the world around them. The Evans book is somewhat more technical but also more helpful for the reader who might wish to dig a little deeper. I had these books with me during the holidays, and I often found them in the hands of family and friends. My brother-in-law asked for (and received) both books for his birthday. Anyone who is curious about what goes on around us, why it happens the way it does, and the possible implications of new things we have learned should enjoy either or both.

(Mr. Tellier is an Information Specialist in the Center for Information and Research Services at LPI and has taught science to high school and college students.)

NASA ADMINISTRATOR ANNOUNCES NEW CENTER DIRECTORS

NASA Administrator Daniel S. Goldin has appointed new Directors for many of NASA's field centers. "The appointments and the emphasis they bring to their respective areas of expertise are in keeping with the President's goal to make government less expensive and more efficient, and to reinvigorate NASA."

Dr. Carolyn Huntoon has been appointed Director of the Johnson Space Center, Houston, Texas. She has served as the Director of Space and Life Sciences at the Johnson Space Center since 1987. Previously she was the Associate Director of the center, assisting the Director and Deputy Director in its management.

Huntoon joined the Johnson Space Center in 1970 as a Senior Research Physiologist and was responsible for conducting research programs in the area of medical endocrinology and biochemistry. She is a pioneer in human life sciences research, having created and supervised projects in the Apollo, Skylab, Apollo-Soyuz, and space shuttle programs. She is the author of numerous technical papers and a fellow of the Aerospace Medical Association and the American Astronautical Society.

Huntoon is a recipient of the Arthur S. Fleming Award, the National Civil Service League Career Achievement Award for her work as a federal civil servant, and numerous other awards. She received her doctorate degree from Baylor University's College of Medicine in 1968.

Dr. Ken K. Munechika has been appointed Director of the Ames Research Center, Mountain View, California. He has been serving as the Executive Director of the Office of Space Industry of the State of Hawaii. He previously held a number of key management and technical positions during a distinguished 31-year Air Force career.

Effective March 1, 1994, the Dryden Flight Research Facility will be established as a separate entity, and will no longer be a part of the Ames Research Center. Kenneth J. Szalai, who currently heads Dryden as a deputy director of Ames, has been appointed as the new director of Dryden, reporting directly to Wesley Harris, Associate Administrator for Aeronautics.

G. P. (Porter) Bridwell has been appointed Director of the Marshall Space Flight Center, Huntsville, Alabama. The current Director, Thomas J. (Jack) Lee, will become the agency's Special Assistant for Access to Space. Bridwell served most recently as Deputy Manager of the Space Station Redesign Team and as a leader of the U.S.-Russian Space Station feasibility study this past summer. He previously served as Manager of the Shuttle Projects Office where he directed the space shuttle project activities assigned to the Marshall Space Flight Center.

Donald J. Campbell has been appointed Director of the Lewis Research Center, Cleveland, Ohio. Campbell currently serves as Director of Science and Technology in the Office of the Assistant Secretary of the Air Force for Acquisition, Washington, DC., an appointment he has held since April 1992. He was responsible for monitoring the Air Force science and technology program and other selected research, development, technology and engineering programs.

NEAR EARTH ASTEROID RENDEZVOUS WILL BE FIRST DISCOVERY MISSION

NASA has begun full-scale development of the first spacecraft to rendezvous with and orbit an asteroid. The Near Earth Asteroid Rendezvous (NEAR) mission received funding in NASA's 1994 budget and will be the first launch in the Discovery Program of small-scale, cost-effective space exploration missions.

NEAR is scheduled for launch in February 1996 aboard a Delta 2 rocket and will arrive at the asteroid Eros in late December 1998 and begin a year of orbiting the asteroid at altitudes as low as 15 miles (24 km). Eros will be the smallest solar system body ever orbited by a spacecraft. The mission offers scientists their first long-term, close-up look at an asteroid.

The Johns Hopkins University Applied Physics Laboratory (APL) will build and operate NEAR, the first NASA planetary mission to be conducted by a non-NASA space center.

The mission's scientific goal is to determine Eros' size, shape, mass, and magnetic field as well as the detailed structure and composition of the asteroid's surface. Asteroids are thought to include debris left over from the earliest days of planetary formation 4.5 billion years ago. NEAR could answer important questions about the birth and evolution of the solar system.

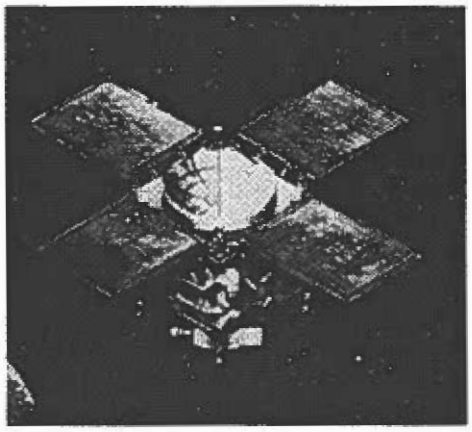
"NEAR represents an exciting, new approach to planetary exploration," said Dr. William Piotrowski, Acting Director of NASA's Solar System Exploration Division. "This mission will answer many long-standing scientific questions about asteroids and it will do it far more cost-effectively than we could have in the past. This is due to recent technological advances and innovations in spacecraft and instrument design, as well as a new philosophy in robotic exploration of the solar system embodied in the Discovery Program."

Eros is one of the largest and bestobserved of the near-Earth asteroids, many of whose orbits cross Earth's path. They are closely related to the more abundant main-belt asteroids, which orbit farther from the Sun in the asteroid belt, a vast, doughnut-shaped ring between Mars and Jupiter. During its journey, NEAR will fly by the small main-belt asteroid Illya in August 1996. It also will swing by Earth for a gravity boost in January 1998.

NEAR's instruments include an X-ray/gamma ray spectrometer, a magnetometer, a near-infrared imaging spectrograph, and a camera fitted with a CCD imaging detector capable of resolving surface features as small as 3 feet (1 meter) across. A laser altimeter will assist in spacecraft navigation, and a radio science experiment will use the NEAR tracking system to determine the asteroid's gravity field.

The NEAR spacecraft design features technologically innovative, state-of-the-art subsystems and instruments. The experiment package is designed to emphasize simplicity, reliability, and low cost. Several instruments are derived from designs developed for Department of Defense spacecraft.

"APL has a long history of total systems capability to do quick turnaround missions with low-cost, reliable 'lightsat' spacecraft," says Dr. Stamatios M. Krimigis, head of APL's Space Department. "The execution phase of the NEAR mission is 29 months, shorter than any in the planetary program over the past two decades."



Artist's conception of the NEAR spacecraft.

APL will conduct mission and science operations from its campus outside Laurel, Maryland. The NEAR mission will be managed by NASA Headquarters in Washington, DC. The NEAR Program Manager at NASA Headquarters is Mary E. Kicza and the Program Scientist is Dr. Jurgen H. Rahe. At APL, the NEAR Project Manager is Thomas B. Coughlin and Robert W. Farquhar is Mission Manager. Andrew F. Cheng is Project Scientist and Andrew Santo is Spacecraft Systems Engineer.

Discovery missions are designed to proceed from development to flight in less than three years, combining well-defined objectives, proven instruments, and flight systems, with total spacecraft and instrument development costs limited to no more than $150 million (in 1992 dollars) and acceptance of a greater level of risk. NEAR funding of $66.2 million was approved for this fiscal year.

GAMMA RAY BURSTS MAY REFLECT STRUCTURE OF THE UNIVERSE

Astronomers have uncovered new evidence that huge explosions, known as gamma ray bursts, occurred in the far reaches of the universe and bear an imprint of the universe's expansion.

Analysis of data from the Compton Gamma Ray Observatory satellite by a team led by Dr. Jay Norris of Goddard Space Flight Center, Greenbelt, Maryland, may indicate that gamma ray bursts show relative "time-dilation." This is an effect that would be created by many of the bursts occurring so far away in the universe that time is seen to be running noticeably slower there.

Time-dilation is described by the General Theory of Relativity and is a consequence of the expansion of the universe. Thus, time intervals from very distant parts of the universe will be stretched as the gamma ray bursts make their way across the expanse of space, which is itself expanding.

This much sought-after result provides additional evidence that gamma ray bursts are not limited to the area of the Milky Way galaxy as some researchers have suggested. "This is a great result, one of the most spectacular astrophysical discoveries of the decade," said Professor Bohdan Paczynski of Princeton University. Paczynski and Dr. Tsvi Piran of Harvard University and Hebrew University of Jerusalem had previously predicted the effect in gamma ray bursts.

Norris was cautious about the meaning of time-dilation. "Our result should not be taken as proof that the time-dilation is a result of cosmological expansion of the universe—just that a difference in durations of bright and dim bursts does exist and must now be accounted for by any theory," Norris said.

"If time-dilation is a result of cosmology," added Goddard-based Dr. Robert Nemiroff of George Mason University and a member of the Norris team, "then this is not only an important discovery about gamma ray bursts, it is a discovery that gamma ray bursts may be able to tell us about distant parts of our universe."

The Norris team, which includes astrophysicists at Goddard and Marshall Space Flight Center, Ames Research Center, and the University of Pennsylvania, uncovered gamma ray burst time-dilation in two ways. First, they showed that dim bursts typically have twice the duration of bright gamma ray bursts. Next, they showed that dim bursts typically are "redder" than bright bursts, an effect that is a direct result of time-dilation on the gamma ray burst spectrum. Norris stressed that while the time-dilation effect itself is well quantified, the spectral difference, though very significant, is yet to be calibrated.

BURSTS OUTSHINE ENTIRE GAMMA RAY "SKY"

Gamma ray bursts are huge explosions that have been detected only in the gamma ray region of the spectrum. Some last only a fraction of a second, but others are as long as a few minutes. A gamma ray burst dramatically outshines the entire sky in gamma-ray wavelengths.

The origins of gamma ray bursts have been an enigma since their discovery in the late 1960s by U.S. defense satellites. But the Compton Gamma Ray Observatory has allowed astronomers to study more bursts in more detail than ever. Until Compton's observations of hundreds of bursts, it was widely believed that the sources of these powerful phenomena were in the Milky Way galaxy.

The celestial distribution of gamma-ray bursts now appears to be uniform, unlike the appearance of the Milky Way galaxy, which looks like a band in the sky. The fact that gamma ray bursts come from all directions is what originally suggested a cosmological, or extragalactic, origin, and so a search for time-dilation began.

If the time-dilation measured by Norris's team is a good indication of gamma ray burst distance, then these bursts are occurring far into the universe. In addition, the brightness of the bursts Compton has observed suggests that the power of these explosions may be greater than anything ever seen before, as much as one quintillion suns.

The astronomical community is cautious about accepting this result blindly. "I like to think I'm objective," said Dr. Thomas Cline, a long-time gamma ray burst researcher at Goddard, "and although the outcome of this analysis is consistent with the hoped-for time-dilation effect, I'm still concerned that it might result from a real but misleading feature of the changing luminosity of gamma ray bursts or a misleading but unreal feature of the data or the satellite. That, of course, only heightens the mystery."

"We've found time-dilation using several statistical tests," said Norris, who described several detailed mathematical and statistical tests that were performed on the data. The spectral difference between bright and dim bursts, also seen in a statistical sense, was found by comparing the spectral colors of bursts across the durations of burst events.

Dr. Virginia Trimble of the University of Maryland and California, Irvine, said, "For more than 50 years, astronomers have been looking for objects or phenomena whose observed properties are dominated by the large scale evolution and structure of the universe ('cosmological effects') rather than by observational selection or the detailed evolution of the individual objects. If the gamma bursts have indeed revealed such cosmological effects, then this is perhaps even more important as an astrophysical 'first' than as a contribution to our understanding of the bursters themselves."

OBSERVATORY BOOSTED TO HIGHER ORBIT

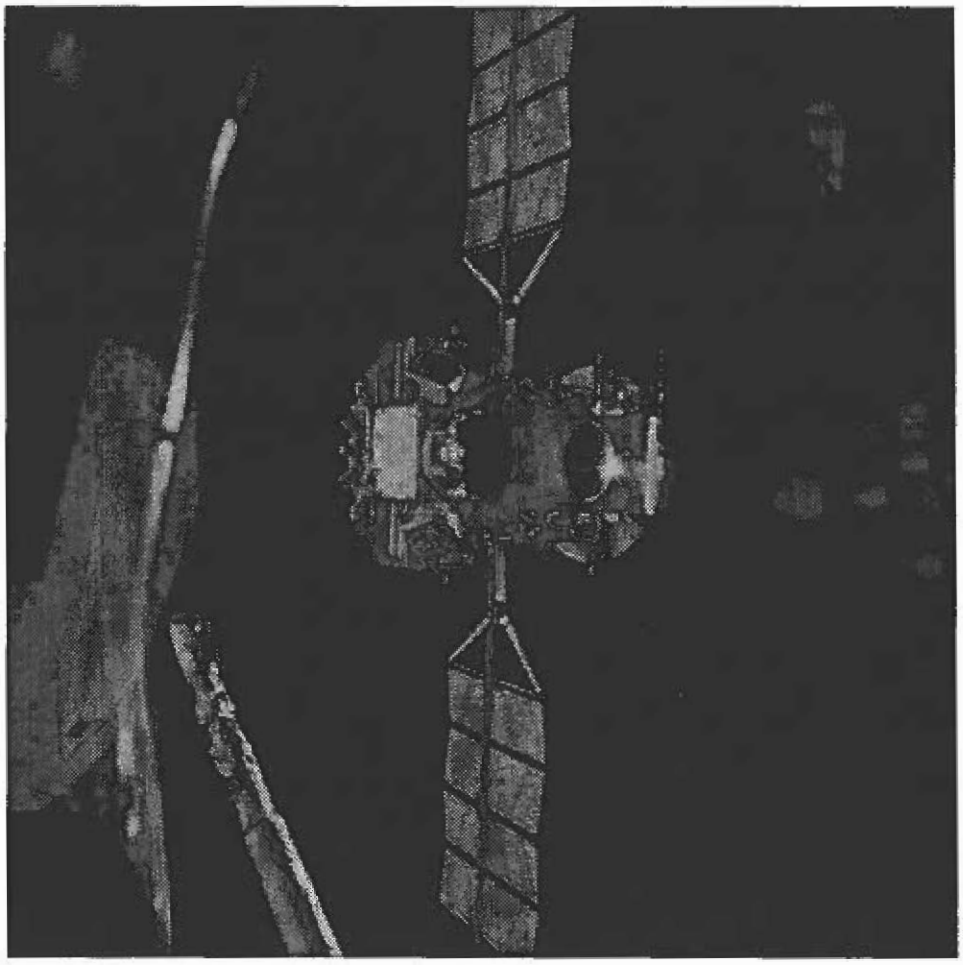
The Norris team analyzed data from Marshall's Burst and Transient Source Experiment (BATSE) onboard Compton, whose principal investigator is Dr. Gerald Fishman. The Compton Gamma Ray Observatory was deployed from the space shuttle *Atlantis* on April 7, 1991. Recently NASA successfully boosted the Observatory into a higher orbit, a move that will keep the 17-ton (15.4 metric ton) satellite from reentering the atmosphere.

The reboost is a significant accomplishment because it extends the mission life of the observatory by five years and prevents a reentry in which large parts from the spacecraft could have struck Earth.

The reboost, which concluded December 17, had been anticipated when the two-year-old spacecraft was designed. It was necessary because of solar activity that slowly pushed the satellite back toward Earth. Initially scheduled earlier in the mission, the reboost was delayed because of the high risk of operating the spacecraft's propulsion system after a problem that occurred shortly after launch.

"Although this reboost always was planned, its successful completion involved solving some complex problems never before encountered by NASA," said Goddard's Tom LaVigna, former deputy project manager for the observatory, who retained management responsibility for the reboost. NASA managers had to compensate for a balky rocket thruster on the observatory and devise a new way to inject fuel into the sensitive plumbing lines leading to the thrusters.

The complex procedure for boosting Compton was developed by Goddard engineers after extensive analysis and simulations. It employed a novel way to operate the observatory propulsion and the attitude control subsystems together to achieve a controlled boost.



The Gamma Ray Observatory is released from the grasp of Atlantis' remote manipulatory system (RMS) and the two spacecraft separate from each other in this 70 mm scene photographed from inside the shuttle's cabin. Before the deployment could happen, astronauts Jerry L. Ross and Jerome (Jay) Apt had to don their spacesuits to perform an emergency extravehicular activity (EVA) to extend GRO's high-gain antenna.

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Pam Thompson, Editor

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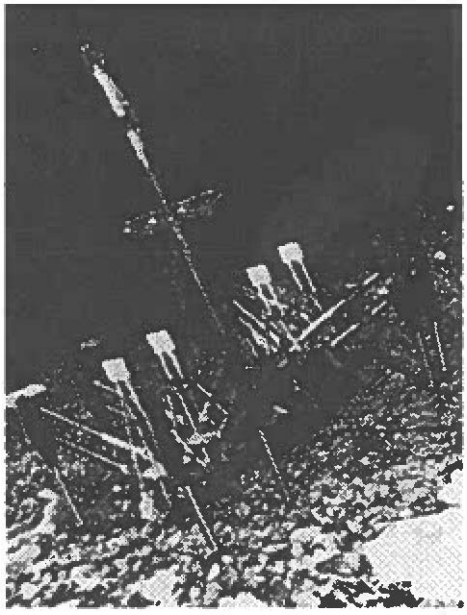

DANTE ROBOT WILL TRY AGAIN AT ALASKAN VOLCANO

NASA, the Alaskan Volcano Observatory (AVO), and Carnegie Mellon University have agreed to a second robotic volcano exploration for Dante, the eight-legged robot that attempted to explore Mt. Erebus in Antarctica last year. NASA will fund modifications by researchers at Carnegie Mellon that will enable Dante to descend into Mt. Spurr, an active volcano about 90 miles west of Anchorage. Dante will attempt geophysical and geological sampling in the crater as a possible prelude to a second attempt to explore Mt. Erebus. Both NASA and AVO are interested in remote robotic volcano explorations as a viable technique for investigating hazardous environments both on and off the Earth. Eight volcanologists have died in recent accidents while doing field studies of volcanos from Japan and Ecuador. Mt. Spurr's crater is considered too dangerous for human exploration at this time, but is of interest to the AVO science team and to the Volcano Hazards Program of the U.S.Geological Survey.

Mt. Spurr was dormant for 39 years until 1992, when it erupted 3 times from a crater off the south flank of the main cone. The crater is at 7575 ft. elevation with a 1000-ft sheer drop on one wall and a rock-strewn 20°–45° slope on the other. This exploration will test Dante's ability to traverse escarpments, deploy scientific equipment, and gather gas samples. Last January, a team involving NASA, Carnegie Mellon, and the National Science Foundation attempted to explore Mt. Erebus, an active volcano in the Antarctic, but the mission was aborted when a fiber-optic cable became kinked and communication between robot and basecamp control station was severed shortly after the robot was deployed.

ULYSSES DIPS SOUTH OF THE SUN'S MAGNETIC EQUATOR

The Ulysses spacecraft—on its way to explore the polar regions of the Sun—has become the first spacecraft to reach farther south than the most southerly dip of the Sun's magnetic equator. In this previously unexplored region, Ulysses observed that the solar wind is twice as fast, but less dense, than near the Sun's equator. Ulysses' solar wind plasma experiment showed wind speeds of about 2 million miles per hour, twice the speed at which the solar wind is known to flow in lower latitudes. The sun's magnetic equator is a tilted sheet of current extending into space that rotates with the Sun and has folds like the skirt of a whirling ballerina. Ulysses is now south of the folds of this current sheet.

Ulysses also observed shock waves propagating through the region. When a fast solar wind stream pushes against a slower flowing one, a shock wave may be generated. A "forward" shock continues in the direction of the overtaking wind, while a so-called "reverse" shock propagates in the opposite direction. Energy concentrated in the compressed region close to the shock can be imparted to charged particles passing through it, accelerating them to cosmic ray energies. At low solar latitudes, within the domain occupied by the wavy current sheet, the interaction of fast and slow solar wind is a common occurrence because of the rotation of the sun, but it is not obvious that this shock-generating mechanism would be found at high solar latitudes. As Ulysses dipped south of the current sheet, quite a few reverse shocks, but few forward shocks, were observed.

Shock waves are also responsible for acceleration of hydrogen, helium, and other atoms that enter the solar system as low-velocity neutrals from interstellar space and become ionized in the solar wind. Eventually, they reach energies at which they appear as "anomalous" cosmic rays. Acceleration to cosmic ray energies was believed to take place in the outermost regions of the heliosphere. However, Ulysses has discovered that much of the acceleration may, in fact, take place much closer to the Sun.

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FEBRUARY

9-12

New Developments Regarding the K/T Event and Other Catastrophes in Earth History, Houston, Texas. Contact: Publications and Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2149; fax: 713-486-2160.
Internet: holley@lpi.jsc.nasa.gov

18-23

American Association for the Advancement of Science, annual meeting, San Francisco, California. Contact: AAAS, 1333 H Street NW, Washington DC 20005. Phone: 202-326-6400.

26-Mar 3

Space 94: 4th International Conference and Exposition on Engineering, Construction, and Operations in Space and Conference and Exposition/Demonstration on Robotics for Challenging Environments, Albuquerque, New Mexico. Contact: Stewart W. Johnson, Space 94 General Chair, BDM International, Inc., 1801 Randolph Road SE, Albuquerque NM 87106. Phone: 505-848-4013; fax: 505-848-5528. *Or:* Action Center, Space 94; Phone: 1-800-SPACE94; fax: 505-272-7355.

MARCH

13-18

Physics of the Magnetopause, San Diego, California. Contact: AGU Meetings Department, 2000 Florida Avenue NW, Washington DC 20009. Phone: 202-462-6900 or (toll free in North America) 1-800-966-2481; fax: 202-328-0566.
Internet: sbell@kosmos.agu.org

13-18

SPIE Symposium on Astronomical Telescopes & Instrumentation for the 21st Century, Kona, Hawaii. Contact: SPIE—The International Society for Optical Engineering, P.O. Box 10, Bellingham WA 98227-0010. Phone: 206-676-3290; fax: 206-647-1445.
Internet: spie@mom.spie.org
CompuServe: 71630,2177

14-18

25th Lunar and Planetary Science Conference, Houston, Texas. Contact: Publications and Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-486-2160.
Internet: simmons@lpi.jsc.nasa.gov

APRIL

8-10

Physics of Accretion Disks Around Compact Objects and Young Stars, Houston, Texas. Contact: Publications and Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-486-2160.
Internet: enticknap@lpi.jsc.nasa.gov

APRIL (CONTINUED)

12-15

IAA/AAS International Conference on Low-Cost Planetary Missions, Laurel, Maryland. Contact: The Johns Hopkins University, Applied Physics Laboratory, Mail Stop 4-266, Johns Hopkins Road, Laurel MD 20723-6099.

18-19

MESUR Pathfinder Landing Site Workshop, Houston, Texas. Contact: Publications and Program Services, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-482-2160.
Internet: simmons@lpi.jsc.nasa.gov

18-19

Workshop on Formation of the Earth's Core, Mainz, Germany. Contact: Herbert Palme, Max-Planck-Institut für Chemie, Postfach 3060, 55020 Mainz, Germany. Phone: 49-6131-305-346; fax: 49-6131-371-290.
Internet: palme@mpch-mainz.mpg.dbp.de

25-30

VIIth International Symposium on the Observation of the Continental Crust through Drilling, Santa Fe, New Mexico. Contact: Earl Hoskins, DOSECC, College of Geosciences & Maritime Studies, Texas A&M University, College Station TX 77843-3148. Phone: 409-845-3651; fax: 409-845-0056.
Internet: hoskins@pluto.tamu.edu

27-28

Exobiological Strategy for the Exploration of Mars, Moffett Field, California. Contact: John F. Kerridge, Code SLC, NASA Headquarters, Washington DC 20546. Phone: 202-358-0292 or 619-534-0921.

MAY

9-12

Tenth Thematic Conference on Geologic Remote Sensing, San Antonio, Texas. Contact: Nancy Wallman, ERIM Thematic Conferences, P.O. Box 134001, Ann Arbor MI 48113-4001. Phone: 313-994-1200, ext. 33234; Fax: 313-994-5123.
Internet: wallman@vaxb.erim.org

15-18

Annual Meeting of the Geological Association of Canada and Mineralogical Association of Canada, Waterloo, Ontario, Canada. Contact: Alan V. Morgan, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada. Phone: 519-885-1211, ext. 3231; fax: 519-746-7484.

MAY (CONTINUED)

16-17

Volcano Instability on Earth and Other Planets, London, UK. Contact: W. J. McGuire, Department of Geological Sciences, University College London, Gower Street, London WC1E 6BT, UK. Phone: 44-71-387-7050, ext. 2383; fax: 44-71-388-7614.

16-19

The Diffuse Interstellar Bands, Boulder, Colorado. Contact: A. G. G. M. Tielens, Mail Stop 245-3, NASA Ames Research Center, Moffett Field CA 94035-1000. Phone: 415-604-6230.

23-27

1994 Joint Spring Meeting of the American Geophysical Union, Mineralogical Society, and Geochemical Society, Baltimore, Maryland. Contact: AGU Meetings Department, 2000 Florida Avenue NW, Washington DC 20009. Phone: 202-939-3203; fax: 202-328-0566. Internet: fspilhaus@kosmos.agu.org

JUNE

5-10

8th International Symposium on Solar Terrestrial Physics, Sendai, Japan. Contact: A. Morioka, Symposium Secretary, Department of Astronomy and Geophysics, Tohoku University, Aramaki, Aoba, Sendai 980, Japan. Fax: 81-22-262-6332.
Internet: morioka@stpp.geophys.tohoku.ac.jp

5-11

ICOG-8: Eighth International Conference on Geochronology, Cosmochronology, and Isotope Geology, Berkeley, California. Contact: ICOG-8, Krebs Convention Management Services, 555 De Haro Street, Suite 200, San Francisco CA 94107-2348. Phone: 415-255-1297; fax: 415-255-8496.

6-8

International Conference on Comparative Planetology, Pasadena, California. Contact: Neil L. Nickle, Jet Propulsion Laboratory, Mail Stop 180-703, 4800 Oak Grove Drive, Pasadena CA 91109-8099. Phone: 818-354-8244; fax: 818-354-1492.

6-10

Conference on Physics of the Moon and Planets, Kharkov, Ukraine. Contact: Irina Belskaya, Astronomical Observatory, Sumskaya Str. 35, 310022 Kharkov, Ukraine. Phone: 0572-43-24-28.
Internet: irina@astron.kharkov.ua

18-24

Gordon Research Conference on Space Plasma Physics, Wolfboro, New Hampshire. Contact: Martin Lee, SSSC-Morse Hall, University of New Hampshire, Durham NH 03824. Phone: 603-862-3509.

JUNE (CONTINUED)

25-30

106th Annual Meeting of the Astronomical Society of the Pacific, Flagstaff, Arizona. Contact: ASP at Universe '94, 390 Ashton Avenue, San Francisco CA 94112. Phone: 415-337-1100.

28-30

ASP Scientific Symposium: Completing the Inventory of the Solar System, Flagstaff, Arizona. Contact: Robert Millis, Lowell Observatory, 1400 W. Mars Hill Road, Flagstaff AZ 86001. Phone: 602-774-3358; fax: 602-774-6296.
Internet: rlm@lowell.edu

JULY

21-22

Workshop on Meteorites from Hot and Cold Deserts, Nördlingen, Germany. Contact: Michael Zolensky, Mail Code SN2, NASA Johnson Space Center, Houston TX. Phone: 713-483-5128; fax: 713-483-5347.
Internet: zolensky@curate.jsc.nasa.gov

25-29

57th Meeting of the Meteoritical Society, Prague, Czech Republic. Contact: Publications and Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-486-2160.

AUGUST

6-11

Small Bodies in the Solar System and Their Interactions with the Planets, Uppsala-Turku, Sweden. Contact: Hans Rickman, Uppsala Astronomical Observatory, Box 515, S-75120, Uppsala, Sweden. Fax: 46-18-527583.

28-30

Meteoroids, Bratislava, Slovakia. Contact: Anton Hajduk or Vladimir Porubcan, Astronomical Institute SAV, Dubravska 9, 84228 Bratislava, Slovakia. Phone: 42-7-375157; fax: 42-7-375157.
Internet: astropor@savba.savba.cs

SEPTEMBER

21-24

Conference on Deep Earth and Planetary Volatiles, Pasadena, California. Contact: Publications and Program Services, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-482-2160.
Internet: simmons@lpi.jsc.nasa.gov

CALENDAR

OCTOBER

13-15

Chondrules and the Protoplanetary Disk, Albuquerque, New Mexico. Contact: Publications and Program Services Department, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-486-2160.
Internet: simmons@lpi.jsc.nasa.gov

16-19

1994 Hypervelocity Impact Seminar, Santa Fe, New Mexico. Contact: Jeanne Southward, Department 1433, Sandia National Laboratories, Albuquerque NM 87185-5800.

31-Nov 4

26th Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society, Washington, DC. Contact: Publications and Program Services, LPI, 3600 Bay Area Boulevard, Houston TX 77058-1113. Phone: 713-486-2166; fax: 713-482-2160.
Internet: simmons@lpi.jsc.nasa.gov

DECEMBER

6-10

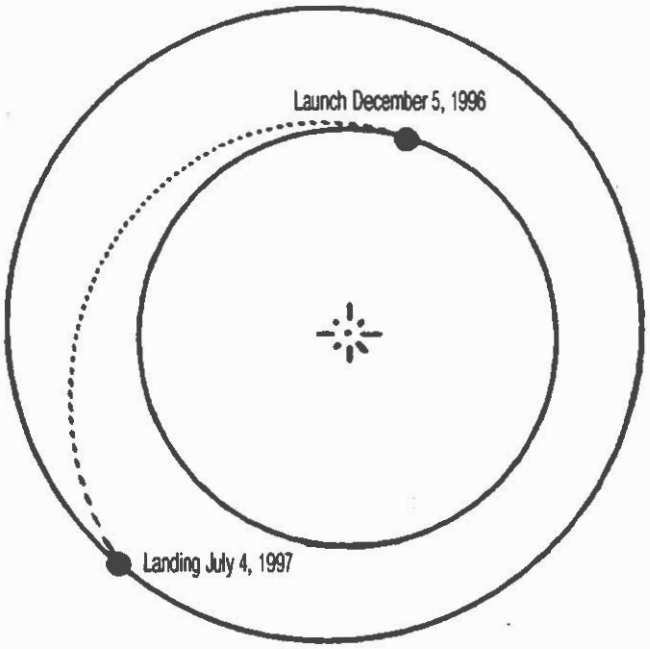
American Geophysical Union, Fall Meeting, San Francisco, California. Contact: AGU Meetings Department, 2000 Florida Avenue NW, Washington DC 20009. Phone: 202-939-3203; fax: 202-328-0566.

MESUR PATHFINDER LANDING SITE WORKSHOP WILL BE HELD APRIL 18–19 AT LPI

This workshop is for interested scientists and engineers to propose potential landing sites for the MESUR Pathfinder lander, which likely will be the next U.S. mission to Mars. The MESUR (Mars Environmental Survey) Pathfinder Project is an approved Discovery mission that will place a single lander on the surface of Mars in July 1997 following launch in December 1996.

The lander is outfitted with a small rover to explore the local area and will carry a lander-based multispectral stereo camera for imaging the landing site, determining local mineralogy, and performing a variety of atmospheric measurements; an alpha proton X-ray spectrometer on the rover for measuring the elemental composition of rocks, soil, and surface materials; and an atmospheric structure/meteorology instrument for obtaining an atmospheric profile and for monitoring the boundary layer after landing. Because the mission will likely be the first U.S. landing on Mars since Viking 20 years ago, the workshop organizers invite the entire Mars scientific community to participate in choosing a landing site.

We plan to have a few project personnel give an overview of the MESUR Pathfinder Project including current lander and rover configuration. Principal Investigators/Team Leaders will be invited to give a summary of their instruments. The rest of the workshop is open for presentations on proposed individual landing sites and the scientific reasons for selecting them. In addition, because landing safety will be an important consideration, presentations on data that can be used to infer the local surface conditions will be included for discussion. Poster space is also available for displaying large images and maps.



Current mission design limits potential landing sites to a latitudinal band centered on 15°N, roughly between the equator and 30°N (for Earth communications and maximum solar power), and to regions with altitudes below the 0-km-elevation reference datum (for parachute performance). The particular point of landing has an uncertainty of roughly 150 km. The nominal surface mission is about 1 month with a goal of 1 year. The rover also carries three monochrome cameras and will operate mostly in view of the lander (within 100 m or so of the lander). The workshop will be run in an abbreviated workshop format to provide an early landing site decision for the project. If you wish to make a presentation or attend and participate in discussion please contact Matthew Golombek, MESUR Pathfinder Project Scientist, Mail Stop 230-235, Jet Propulsion Laboratory, Pasadena CA 91109. Phone: 818-354-3883 or 818-393-7948. E-mail: mgolombek@nasamail.nasa.gov

INSIDE

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