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**BULLETIN**

*May 2005  
Issue 102*

# 36TH LUNAR AND PLANETARY SCIENCE CONFERENCE

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The 36th Lunar and Planetary Science Conference (LPSC) marked another incredible record-breaking year, with 1460 participants from 24 countries attending the conference held at the South Shore Harbour Resort and Conference Center in League City, Texas, on March 14–18, 2005. This year's attendance statistics (see inset) reflect a continuing excitement about the future of planetary science. The marked increase in the number of attendees had the potential for presenting a logistical nightmare for conference organizers and staff, but the introduction of overflow seating accommodations for some of the more popular sessions met with tremendous success.



## Attendance from Non-U.S. Countries

Algeria:	1
Australia:	10
Austria:	3
Belgium:	1
Canada:	24
Croatia:	1
Czech Republic:	2
Denmark:	5
Finland:	4
France:	53
Germany:	48
Hungary:	7
India:	2
Italy:	9
Japan:	75
Netherlands:	7
Norway:	4
Portugal:	1
Russia:	3
Spain:	5
Sweden:	2
Switzerland:	10
Syria:	1
United Kingdom:	51

**Total non-U.S. attendees: 328**

LPSC has long been recognized among the international science community as the most important planetary conference in the world, and this year's meeting substantiated the merit of that reputation. Hundreds of planetary scientists attended both oral and poster sessions focusing on such diverse topics as the Moon, Mars, Mercury, and Venus; outer planets and satellites; meteorites; comets, asteroids, and other small bodies; impacts; interplanetary dust particles and presolar grains; origins of planetary systems; planetary formation and early evolution; and astrobiology. Sunday night's registration and reception were held at the Center for Advanced Space Studies, which houses the Lunar and Planetary Institute. Also featured on Sunday night was an open house for the display of education and public outreach activities and programs.

Highlights of the conference program, established by the program committee under the guidance of co-chairs Dr. Stephen Mackwell (Lunar and Planetary Institute) and Dr. Eileen Stansbery (NASA Johnson Space Center), included special sessions dedicated to the exciting results of the Cassini mission, with particular emphasis on the landing of the Huygens probe on the surface of Titan; the current status of samples returned by the Genesis mission, along with speculation about the scientific results that would be gained from these samples; new insights into the surface composition of Mars as a result of the OMEGA instrument flown on the Mars Express mission; and current information on Mars polar atmosphere and surface interactions.

During the Monday afternoon plenary session, the Masursky Lecture was presented by retired astronaut Captain John Young. In his talk, entitled "The Future of Human Space Exploration and Why," Young talked about his experiences as an astronaut on the Apollo 16 mission and the first flight of the U.S. space shuttle, and presented his views on why it is important that NASA continue the human exploration of the solar system. At the end of his talk, Young was presented with a gift of his very own piece of the Moon, a slice from lunar meteorite Dhofar 026. Later that evening, a student/scientist reception provided students with an opportunity to meet and interact with established professionals in the field of planetary science.

# 36TH LPSC

On Monday evening, staff from NASA Headquarters briefed the community on NASA's vision for space exploration, how the vision could be fulfilled, and NASA's strategic roadmap for ongoing and future science missions. Wednesday evening provided the community with an opportunity to provide input for targeting sites for observation by the Mars Reconnaissance Orbiter.

Plans are already underway for the 37th LPSC, which will again be held at South Shore Harbour Resort and Conference Center. The dates for next year's conference will be March 13–17, 2006, with the first announcement scheduled for release later this summer.

*Mark your calendars!*

## 36TH LPSC AT A GLANCE

Total number of attendees: 1460  
Student attendees: 390  
Abstracts received: 1409  
Abstracts accepted: 1383  
Oral presentations: 497  
Poster presentations: 781



*John Young discusses his experiences as an astronaut and his views about human exploration of space.*



*Dr. Allan Treiman presents Young with a slice of lunar meteorite Dhofar 026.*



*Scientists and educators present displays featuring education and public outreach activities and programs.*



*The poster sessions are a popular event during the week.*

*Orlando Figueroa of NASA Headquarters briefs the community on current and future missions.*



# NEWS FROM SPACE

## **HUBBLE CELEBRATES 15TH ANNIVERSARY WITH SPECTACULAR NEW IMAGES**

During the 15 years NASA's Hubble Space Telescope has orbited the Earth, it has taken more than 750,000 photos of the cosmos, images that have awed, astounded, and even confounded astronomers and the public. In late April, NASA released new views of two of the most well-known objects Hubble has ever observed: the Eagle Nebula and the Whirlpool Galaxy (spiral galaxy M51). These new images are among the largest and sharpest Hubble has ever taken. They were made with Hubble's newest camera, the Advanced Camera for Surveys (ACS). The images are so incredibly sharp, they could be enlarged to billboard size and still retain stunning details.

For the 15th anniversary, scientists used the ACS to record a new region of the eerie-looking Eagle Nebula. The Eagle Nebula image reveals a tall, dense tower of gas being sculpted by ultraviolet light from a group of massive, hot stars. The new Whirlpool Galaxy image showcases the spiral galaxy's classic features, from its curving arms, where newborn stars reside, to its yellowish central core that serves as home for older stars. A feature of considerable interest is the companion galaxy located at the end of one of the spiral arms. The mural-sized celestial images of the Eagle Nebula and Whirlpool Galaxy were unveiled at the Smithsonian's National Air and Space Museum in Washington. More than 100 museums, planetariums, and science centers also unveiled these same images.

The space shuttle Discovery placed the Hubble into Earth orbit on April 25, 1990, opening a new era in astronomy. For the first time, a large telescope that viewed in visible light orbited above Earth's distorting atmosphere, which blurs light, making images appear fuzzy. After installation of a new camera and a device that compensated for an improperly ground mirror, images of planets, stars, galaxies, and nebula began pouring in — most up to 10 times sharper than delivered by any previous telescope.

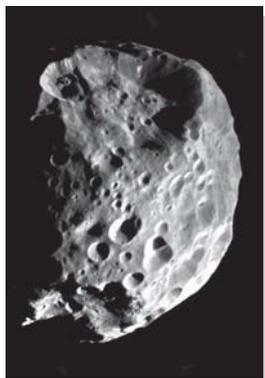
Hubble has compiled a long list of scientific achievements since its launch: Hubble has helped astronomers calculate the precise age of the universe (13.7 billion years); helped confirm the existence of a strange form of energy called dark energy; detected small protogalaxies that emitted their light when the universe was less than a billion years old; proved the existence of super-massive black holes; provided sharp views of a comet hitting Jupiter; and showed that the process of forming planetary systems is common throughout the galaxy. Hubble imagery is managed by the Space Telescope Science Institute (<http://www.stsci.edu>).

## **SCIENTISTS DISCOVER PLUTO KIN IS A MEMBER OF SATURN FAMILY**

Saturn's battered little moon Phoebe is an interloper to the Saturn system from the deep outer solar system, scientists have concluded. The new findings appear in the May 5 issue of the journal *Nature*. "Phoebe was left behind from the solar nebula, the cloud of interstellar gas and dust from which the planets formed," said Dr. Torrence Johnson, Cassini imaging team member at NASA's Jet Propulsion Laboratory. "It did not form at Saturn. It was captured by Saturn's gravitational field and has been waiting eons for Cassini to come along."

Cassini flew by Phoebe on its way to Saturn on June 11, 2004. Little was known about Phoebe at that time. During the encounter, scientists got the first detailed look at Phoebe, which allowed them to determine its makeup and mass. With the new information they have concluded that it has an outer solar system origin, akin to Pluto and other members of the Kuiper belt. "Cassini is showing us that Phoebe is quite different from Saturn's other icy satellites, not just in its orbit but in the relative proportions of rock and ice. It resembles Pluto in this regard much more than it does the other saturnian satellites," said Dr. Jonathan Lunine, Cassini interdisciplinary scientist from the University of Arizona, Tucson.

Phoebe has a density consistent with that of the only Kuiper belt objects for which densities are known. Phoebe's mass, combined with an accurate volume estimate from images, yields a density of about 1.6 grams per cubic centimeter (100 pounds per cubic foot), much lighter than most rocks but



*Phoebe's true nature is revealed in startling clarity in this mosaic of two images taken during Cassini's flyby on June 11, 2004. The image shows evidence for the emerging view that Phoebe may be an ice-rich body coated with a thin layer of dark material. Image courtesy of NASA/JPL/Space Science Institute.*



*Images of the Whirlpool Galaxy (left) and Eagle Nebula (right) taken by the Hubble Space Telescope. Image courtesy of NASA/ESA/S. Beckwith (STScI)/Hubble Heritage Team.*

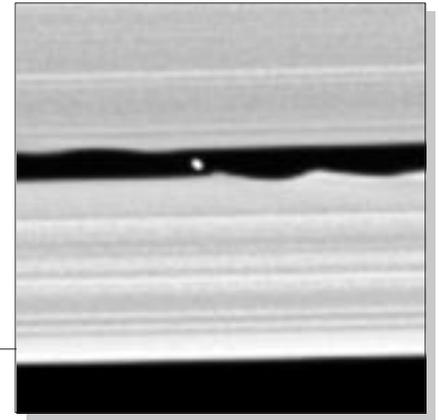
heavier than pure ice, which is about 0.93 grams per cubic centimeter (58 pounds per cubic foot). This suggests a composition of ice and rock similar to that of Pluto and Neptune's moon Triton. Whether the dark material on other moons of Saturn is the same primordial material as on Phoebe remains to be seen.

## **CASSINI FINDS NEW SATURN MOON THAT MAKES WAVES**

In a spectacular kick-off to its first season of prime ring viewing, which began last month, the Cassini spacecraft has confirmed earlier suspicions of an unseen moon hidden in a gap in Saturn's outer A ring. A new image and movie show the new moon and the waves it raises in the surrounding ring material. The moon, provisionally named S/2005 S1, was first seen in a time-lapse sequence of images taken on May 1, 2005, as Cassini began its climb to higher inclinations in orbit around Saturn. A day later, an even closer view was obtained, which has allowed a measure of the moon's size and brightness. Cassini images can be seen at <http://saturn.jpl.nasa.gov>, <http://www.nasa.gov/cassini>, and <http://ciclops.org>.

The images show the tiny object in the center of the Keeler gap and the wavy patterns in the gap edges that are generated by the moon's gravitational influence. The Keeler gap is located about 250 kilometers (155 miles) inside the outer edge of the A ring, which is also the outer edge of the bright main rings. The new object is about 7 kilometers (4 miles) across and reflects about half the light falling on it — a brightness typical of the particles in the nearby rings.

S/2005 S1 is the second known moon to exist within Saturn's rings. The other is Pan, which orbits in the Encke gap. Atlas and other moons exist outside the main ring system, as do the two F-ring shepherd moons, Prometheus and Pandora.



*Cassini's confirmation that a small moon orbits within the Keeler gap in Saturn's rings is made all the more exciting by this image, in which the disk of the 7-kilometer-wide (4-mile-wide) body is resolved for the first time. Image courtesy of NASA/JPL/Space Science Institute.*

## **NASA'S DEEP IMPACT SPACECRAFT SPOTS ITS QUARRY**

Sixty-nine days before it will get up-close-and-personal with a comet, NASA's Deep Impact spacecraft successfully photographed its quarry, Comet Tempel 1, from a distance of 64 million kilometers (39.7 million miles). "It is great to get a first glimpse at the comet from our spacecraft," said Principal Investigator Dr. Michael A'Hearn of the University of Maryland, College Park. "With daily observations beginning in May, Tempel 1 will become noticeably more impressive as we continue to close the gap between spacecraft and comet."

"This is the first of literally thousands of images we will take of Tempel 1 for both science and navigational purposes," said Deputy Program Manager Keyur Patel at NASA's Jet Propulsion Laboratory. "Our goal is to impact a one-meter long (39-inch) spacecraft into about a 6.5-kilometer wide (4-mile) comet that is bearing down on it at 10.2 kilometers per second (6.3 miles per second), while both are 133.6 million kilometers (83 million miles) away from Earth. By finding the comet as early and as far away as we did is a definite aid to our navigation."

Deep Impact is comprised of two parts, a "flyby" spacecraft and a smaller "impactor." The impactor will be released into the comet's path for a planned high-speed collision on July 4. The crater produced by the impact could range in size from the width of a large house up to the size of a football stadium and from 2 to 14 stories deep. Ice and dust debris will be ejected from the crater, revealing the material beneath. For images and more information about the Deep Impact mission, visit <http://deepimpact.jpl.nasa.gov>.

## **NASA ANNOUNCES KEY GENESIS SCIENCE COLLECTORS IN EXCELLENT SHAPE**

Scientists have closely examined four Genesis spacecraft collectors, vital to the mission's top science objective, and found them in excellent shape, despite the spacecraft's hard landing last year. Scientists at NASA's Johnson Space Center removed the four solar-wind collectors from an instrument called the concentrator. The concentrator targets collected solar-oxygen ions during the Genesis mission. Scientists will analyze them to measure solar-oxygen isotopic composition, the highest-priority measurement objective for Genesis. The data may hold clues to increase understanding about how the solar system formed. "Taking these concentrator targets out of their flight holders and getting our first visual inspection of them is very important," said Karen McNamara, Genesis curation recovery lead. "This step is critical to moving forward with the primary science Genesis was intended to achieve. All indications are the targets are in excellent condition." For more information about the Genesis mission, visit <http://www.nasa.gov/genesis>.

## NASA'S SPITZER TELESCOPE SEES SIGNS OF ALIEN ASTEROID BELT

NASA's Spitzer Space Telescope has spotted what may be the dusty spray of asteroids banging together in a belt that orbits a star like our Sun. The discovery offers astronomers a rare glimpse at a distant star system that resembles our home, and may represent a significant step toward learning if and where other Earths form.

"Asteroids are the leftover building blocks of rocky planets like Earth," said Dr. Charles Beichman of the California Institute of Technology. Beichman is lead author of a paper that will appear in the *Astrophysical Journal*. "We can't directly see other terrestrial planets, but now we can study their dusty fossils," he added.

If confirmed, the new asteroid belt would be the first detected around a star about the same age and size as our Sun. The star, called HD69830, is located 41 light years away from Earth. There are two other known distant asteroid belts, but they circle younger, more massive stars.

For more about the Spitzer Space Telescope, visit

<http://www.spitzer.caltech.edu/spitzer>.

*This artist's concept illustrates what the night sky might look like from a hypothetical alien planet in a star system with an asteroid belt 25 times as massive as the one in our own solar system (alien system on top, ours below). Image courtesy of NASA/JPL/Caltech/R. Hurt (SSC).*



# SPOTLIGHT ON EDUCATION

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*“Spotlight on Education” highlights events and programs that provide opportunities for space scientists to become involved in education and public outreach and to engage science educators and the community. If you know of space science educational programs or events that should be included, please contact the Lunar and Planetary Institute at [outreach@lpi.usra.edu](mailto:outreach@lpi.usra.edu).*

## **PLANETARY DATA IN EDUCATIONAL SETTINGS WORKSHOP**

In association with the Solar System Exploration Education Forum Community Meeting, the Planetary Data in Learning Environments Community will meet at the Jet Propulsion Laboratory in Pasadena, California, on **August 1, 2005**, for a one day workshop that will examine models for engaging students and the public in science through the use of NASA mission and research data. Participants will explore the elements that define successful programs, as well as lessons learned from program design and implementation. Breakout groups will examine issues of successes and challenges in more detail, including identifying audience needs, technical challenges, and training components. Each group will pose evaluation questions to be included a survey of the data-use audience.

Earth and planetary data providers, scientists, product developers, education specialists, and formal and informal educators are invited to participate and share their experiences. For more information, contact Stephanie Shipp at [shipp@lpi.usra.edu](mailto:shipp@lpi.usra.edu).

## **ASTRONOMICAL SOCIETY OF THE PACIFIC 117TH ANNUAL MEETING**

The Astronomical Society of the Pacific’s Annual Meeting, September 14–16, 2005, will focus on building and supporting the community of individuals and groups engaged in education and public outreach in the disciplines of astronomy, astrobiology, space, and Earth science. The conference is intended to improve the quality and increase the effective dissemination of E/PO materials, products, and programs. NASA and NSF-funded E/PO program managers, developers, and evaluators; scientists involved in E/PO efforts; formal and informal educators; public outreach specialists; and amateur astronomers working with the public are encouraged to attend. For more information and to register, please visit <http://www.astrosociety.org/events/meeting.html>.



## **PRE-SERVICE TEACHER PREPARATION CONFERENCE — RECOMMENDATIONS FOR COMMUNITY INVOLVEMENT**

The Pre-Service Educators Working Group of NASA’s Science Mission Directorate’s Support Network hosted “Before the First Day of School: Pre-Service Teacher Preparation and the Role of the Earth and Space Science Community” in March in Houston, Texas. Over 50 Earth and space scientists; education specialists; and formal, informal, and pre-service educators attended. Presentations focused on sharing existing pre-service models, examining where Earth and space science content and pedagogy fit into pre-service programs, and paths for scientists to become involved in teacher preparation. Audience discussion further explored these topics and offered recommendations for community involvement and action. Recommendations concentrated on the following topics:

*What can Earth and space scientists do to facilitate teacher involvement in space science?*

- ❖ Model effective teaching practices. Ultimately, pre-service educators will need to involve K–12 students in hands-on inquiry-based science learning; science content courses are too often lecture-based and do not address this need.
- ❖ Identify content that should be emphasized in the K–12 science classroom based on national and state science education standards; train pre-service educators in this content.
- ❖ Help pre-service educators understand the process of science through content connections and authentic field experiences and/or summer internships.
- ❖ Identify appropriate K–12 classroom resources/tools that augment Earth and space content concepts and incorporate these pre-service educator preparation.
- ❖ Consider mentoring a pre-service teachers before and during at least the first few years of teaching.
- ❖ More information is available at [http://www.lpi.usra.edu/education/score/ps\\_wksp\\_2005/panel\\_review.shtml](http://www.lpi.usra.edu/education/score/ps_wksp_2005/panel_review.shtml).

*What can be done at a higher level of administration to prepare pre-service educators?*

- ❖ Understand why careful preparation of pre-service educators is important! Teachers teach what they are trained to teach. If pre-service educators do not participate in science, technology, engineering, and mathematics (STEM) content in a meaningful way, they will not be comfortable and will not expose their students to STEM content.
- ❖ Recognize and respect that preparation of pre-service educators involves many individuals, disciplines, departments, administrations, and experiences. Often, this is not coordinated. Invite discussion and collaboration among these stakeholders.
- ❖ STEM departments should work with schools of education to
  - ♦ Encourage the “best teachers” in the STEM department to teach the introductory courses and reward them for innovative teaching.

- ◆ Support STEM scientists in becoming effective teachers through professional development opportunities (e.g., offer workshops on effective teaching, support them in participating in such workshops or conferences, support networking, etc.).
- ◆ Help identify the content that is necessary for pre-service educators to master using national and state science standards and help scientists match content with appropriate pedagogy, resources, and tools that can be ported into the pre-service educator's future classroom.
- ◆ Create incentives, such as grants or stipends, for scientists to assist pre-service educators as coaches and mentors.
- ❖ More information is available at [http://www.lpi.usra.edu/education/score/ps\\_wksp\\_2005/panel\\_review.shtml](http://www.lpi.usra.edu/education/score/ps_wksp_2005/panel_review.shtml).

Other recommendations concentrated on what Earth and space scientists/NASA can do to better prepare teachers and help them stay in teaching longer, and how interested scientists can get university administrations to invest in pre-service education. For a complete list of recommendations, as well as the workshop agenda, presentations, and participants, please visit [http://www.lpi.usra.edu/education/score/ps\\_wksp\\_2005/](http://www.lpi.usra.edu/education/score/ps_wksp_2005/).

## ***NASA PLANETARY SCIENCE SUMMER SCHOOL FOR GRADUATE STUDENTS AND POST-DOCS***



NASA's 17th Annual Planetary Science Summer School will hold two sessions this summer — **July 25–29** and **August 1–5, 2005** — at the Jet Propulsion Laboratory in Pasadena, California. Science and engineering post-doctoral and graduate students with a strong interest in careers in planetary exploration are encouraged to apply. Student teams will carry out the equivalent of an early concept study responsive to a selected NASA Announcement of Opportunity, prepare a proposal authorization review presentation, present it to a review board, and receive feedback. At the end of the week, students will have a clearer understanding of the relationships among mission design, cost, and schedule, and the trade-offs necessary to stay within cost and schedule while preserving the opportunity to acquire high-quality science. They will also understand the lifecycle of a space mission. Partial financial support is available to a limited number of individuals to help defray the expense of travel and lodging only. Applications are to be submitted electronically by **June 3, 2005**, at the Web site at <http://www2.jpl.nasa.gov/pscischool/>. For further information, visit the Web site or contact Ms. Anita Sohus (phone: 818-354-6613; e-mail: [Anita.M.Sohus@jpl.nasa.gov](mailto:Anita.M.Sohus@jpl.nasa.gov)).

## ***ASTRONOMY WORKSHOP FOR K–12 EDUCATORS***

The University of Hawai'i Hilo and the Mauna Kea Astronomy Education Center in Hilo, Hawai'i, offer a week-long astronomy program, "Astro-Vaganza," for teachers of grades K–12 from June 27 to July 1, 2005. Participants will experience astronomy content, Polynesian culture, and wayfinding, and can also visit Hawai'i while earning credit. More information can be found at [http://maunakea.hawaii.edu/astro\\_flier\\_final.pdf](http://maunakea.hawaii.edu/astro_flier_final.pdf).

## ***DEEP IMPACT EDUCATIONAL RESOURCES***



On July 4, 2005, the Deep Impact spacecraft arrives at Comet Tempel 1. It will release a 370-kilogram (~820-pound) impactor that will strike the comet, creating a crater and revealing the interior composition and structure. The Deep Impact

education team offers a variety of activities and materials for teachers, students, and the general public. Students can observe and model comets in preparation for the Deep Impact events through activities presented for a variety of learning levels. They can explore comet composition, structure, and origin, along with the behavior of comets as they orbit our Sun, as well as understand how scientists study these occasional visitors to our inner solar system. For activities and resources, visit the Web site at <http://deepimpact.jpl.nasa.gov/educ/index.html>.

## ***BRING PLANETARY DATA INTO THE CLASSROOM WITH JULES VERNE VOYAGER***

Want to have your students investigate volcanos on the surface of Venus or craters on Mars? UNAVCO's Jules Verne Voyager (<http://jules.unavco.org/>) is an interactive, browser-based mapping tool that allows visitors to virtually explore and create maps of Earth and other planetary bodies using NASA mission data. Originally designed to help users visualize relationships between Earth's geophysical and geologic processes and structures using GPS data, Voyager can create similar visualizations for other planetary bodies. Visitors can pan and zoom maps of Mercury (Mariner 10 data), Venus (Magellan), the Moon (Clementine), Mars (Mariner 9, Viking Orbiter, MGS/MOLA, and MGS/MOC), and Jupiter and its moons (Voyager, Galileo, and Cassini).



*Interested in becoming more involved in space science education and public outreach? NASA's OSS Support Network encompasses a nationwide network of Broker/Facilitators and Education Forums that are prepared to assist space science investigators in developing high-quality, high-impact E/PO programs. For more information about the network, or to contact the Broker/Facilitator in your region, please visit <http://spacescience.nasa.gov/education/index.htm>.*

# MILESTONES

## **MICHAEL GRIFFIN TAKES HELM AS NASA ADMINISTRATOR**

Michael Griffin is returning to NASA as the Agency's 11th Administrator. He reported to work at NASA Headquarters in Washington on Thursday, April 14, the same day the Expedition 11 crew launched to the International Space Station.

"I have great confidence in the team that will carry out our nation's exciting, outward-focused, destination-oriented program," said Griffin. "I share with the agency a great sense of privilege that we have been given the wonderful opportunity to extend humanity's reach throughout the solar system." Administrator Griffin, who served as NASA's Chief Engineer earlier in his career, takes the helm of the Agency as it is charting a new course. The space shuttle fleet is poised to return to flight, the first step in fulfilling NASA's Vision for Space Exploration — a bold plan to return humans to the Moon and journey to Mars and beyond.



*NASA Administrator Michael Griffin (far left) takes the oath of office during a private ceremony. Photo courtesy of NASA/Renee Bouchard.*

Griffin was confirmed by the U.S. Senate on April 13, 2005. At his confirmation hearing on April 12, he made it clear that the "strategic vision for the U.S. manned space program is of exploration beyond low Earth orbit." In his statement to the committee, Griffin said, "It is a daring move at any time for a national leader to call for the bold exploration of unknown worlds, a major effort at the very limit of the technical state of the art," adding later, "in the twenty-first century and beyond, for America to continue to be preeminent among nations, it is necessary for us also to be the preeminent spacefaring nation."

A holder of five master's degrees and a Ph.D., Griffin also made clear that, despite limited resources, "NASA can do more than one thing at a time . . . My conclusion is that we as a nation can clearly afford well-executed, vigorous programs in both robotic and human space exploration as well as in aeronautics. We know this. We did it," he said, referring back to the Agency's accomplishments during the Apollo era.

## **GENE CERNAN AWARDED AMBASSADOR OF EXPLORATION HONOR**



Apollo 17 Commander Eugene A. Cernan received NASA's first Ambassador of Exploration Award during a special symposium held in May at the U.S. Naval Air Station in Pensacola, Florida. The award will remain on display at the National Museum of Naval Aviation.

The Ambassador of Exploration Award was announced last July during the 35th anniversary celebration of the Apollo 11 lunar landing. It recognizes the sacrifices and dedication of the Apollo, Gemini, and Mercury astronauts. Each astronaut or their surviving families will be presented a lunar sample, part of the 842 pounds of Moon rocks and soil returned during the six lunar expeditions from 1969 to 1972.

In a letter read during the presentation in Florida, NASA Administrator Michael Griffin said, "The purpose of these awards is to recognize the tremendous contributions America's first generation of astronauts have made to space exploration and to help inspire a new generation to carry the torch of exploration throughout the solar system. Your outstanding service on three space missions, including two Apollo voyages to the Moon, and your challenge to America's youth to 'take us back out there where we belong,' have demonstrated the essence of what our Ambassador of Exploration Awards are all about."

Cernan, a Captain in the U.S. Navy, left his mark on the history of exploration by flying three times in space, twice to the Moon. He also holds the distinction of being the second American to walk in space and the last human to leave his footprints on the lunar surface. He was one of 14 astronauts selected by NASA in October 1963. He piloted the Gemini 9 mission with Commander Thomas P. Stafford on a three-day flight in June 1966. Cernan logged more than two hours outside the orbiting capsule. In May 1969, he was the lunar module pilot of Apollo 10, the first comprehensive lunar-orbital qualification and verification test of the lunar lander. The mission confirmed the performance, stability, and reliability of the Apollo command, service, and lunar modules. The mission included a descent to within eight nautical miles of the Moon's surface.

Cernan concluded his historic space exploration career as commander of the last human mission to the Moon in December 1972. Apollo 17 established several new records for human space flight, including the longest lunar landing flight (301 hours, 51 minutes); longest lunar surface extravehicular activities (22 hours, 6 minutes); largest lunar sample return (nearly 249 pounds); and longest time in lunar orbit (147 hours, 48 minutes). On July 1, 1976, Cernan retired from the Navy after 20 years and ended his NASA career.

As Ambassadors of Exploration, the recipients will continue to help communicate the benefits and excitement of space exploration and work to inspire students to pursue careers in science, mathematics and engineering.

The Ambassador of Exploration Award recognizes the sacrifices and dedication of the Apollo, Gemini, and Mercury astronauts. An inscription describes the rock as "a symbol of the unity of human endeavor and mankind's hope for a future of peace and harmony."

## ***FROM THE EDITOR'S DESK: IMPORTANT NOTICE ABOUT NOTIFICATION OF FUTURE ISSUES***

This issue is the last one for which postcard notification will automatically be mailed! If you have not already contacted us, and you wish to continue receiving these notifications via postcard, you must write to us at LPI Notifications, 3600 Bay Area Boulevard, Houston TX 77057-1113.

Remember that you can also request e-mail notification by contacting us at **[lpibeditor@lpi.usra.edu](mailto:lpibeditor@lpi.usra.edu)**.

Readers who do not respond by either of the methods listed above will no longer receive notification of new issues of the *Bulletin*.

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The *Bulletin* welcomes articles dealing with issues related to planetary science and exploration. The copy deadline for the next issue is **July 1, 2005**. Articles or announcements should be submitted via e-mail to **[lpibed@lpi.usra.edu](mailto:lpibed@lpi.usra.edu)**.

To be added to the mailing list to receive notification of future issues, please send your address (along with phone, fax, and e-mail), to LPIB Editor, 3600 Bay Area Boulevard, Houston TX 77058-1113, USA, or send an e-mail message to **[lpibed@lpi.usra.edu](mailto:lpibed@lpi.usra.edu)**.

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### ***Solicitation for Contributions***

Contributions to the *Lunar and Planetary Information Bulletin (LPIB)* are solicited from the planetary community and beyond. Articles exploring issues related to planetary science and exploration are welcome. Of special interest are articles describing Web-based research and educational tools, meeting highlights and summaries, and descriptions of new space missions that may be of interest to our readers. Peer-reviewed research articles, however, are not appropriate for publication in the *LPIB*. The *LPIB* is published quarterly and serves the planetary research community, science libraries, educators, students, and lay readers interested in space-science-related research. Suggested topics can be e-mailed to the editors, who will provide guidelines for formatting and content.

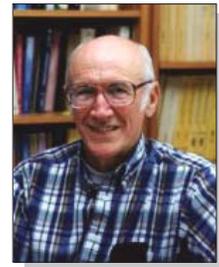
*Dr. Paul Schenk,*  
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*Renée Dotson,*  
*Production Editor ([dotson@lpi.usra.edu](mailto:dotson@lpi.usra.edu))*

# IN MEMORIAM

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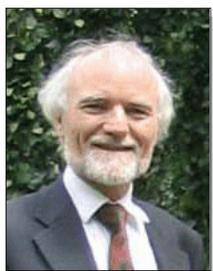
## LARRY A. HASKIN

Larry A. Haskin died on March 24, 2005, of myelofibrosis, a bone marrow disease for which he had been treated for more than 15 years. He was 70 years old. Larry was born and raised on a farm west of Kansas City. He majored in chemistry at Baker University and earned a Ph.D. in physical chemistry from the University of Kansas in 1960 in the laboratory of F. Sherwood Rowland. That year he joined the faculty of the Department of Chemistry at the University of Wisconsin–Madison. In the 1960s, Larry’s research helped establish the field of rare-earth-element geochemistry. In 1969, he was one of the researchers to study the first lunar samples returned by the Apollo 11 mission. He continued his lunar research until his death. In 1973 Larry left the University of Wisconsin–Madison to become Chief of the Planetary and Earth Sciences Division at the NASA Johnson Space Center (JSC) in Houston. One of his major accomplishments at JSC was to begin the task of securing the lunar sample collection for future researchers by building a safer, modern curatorial facility. In 1976, Larry became Professor and Chairman (1976–1990) of the Department of Earth and Planetary Sciences at Washington University in Saint Louis. His efforts transformed a foundering geology department into a first-class department of Earth and planetary sciences. He officially retired at the end of 2002, but remained active in research. Since 1995 much of Larry’s energy was focused on developing a Raman spectrometer for use in mineral identification on a Mars lander. He spent several months of the last year of his life at the NASA Jet Propulsion Laboratory as a science team member for the Mars Exploration Rover mission.



Over his lifetime, Larry’s research interests spanned geochemical analysis and modeling, electrochemistry of molten silicates, lunar and martian geochemistry and mineralogy, terrestrial analogs of lunar rocks, lunar resource utilization, geochemistry and geophysics of impact cratering, and the use of trace elements to determine provenance of archaeological artifacts. Perhaps more important than his contribution to a wide body of scientific knowledge is the legacy of students and colleagues that he influenced with his wisdom, integrity, enthusiasm, humor, and unexpected way of thinking about nearly everything.

## MICHEL C. FESTOU



Michel C. Festou, Director of Research at the Astrophysics Laboratory of Toulouse-Tarbes at Midi-Pyrenees Observatory in France, died on May 11 at the age of 60 after a recent diagnosis of stomach cancer. Michel was a widely recognized expert in the study of comets, with particular interest in their chemical properties as determined through measurements of their ultraviolet radiation. He received his Ph.D. from the University of Paris VI in 1978 under the direction of Jacques Blamont. In his thesis, he developed his “vectorial model,” which describes the kinematics of gases in the cometary comae and has become a standard for interpreting coma emissions from many atomic and molecular species. Typical of Michel’s generosity, he freely gave away copies of his modeling program to anyone who asked and patiently helped them learn how to use it. He

played a major role in an observational campaign of comets performed with the International Ultraviolet Explorer (IUE) satellite over a period of 18 years. Michel’s continuing cometary interest and expertise led him to become a co-investigator for the ultraviolet spectrograph onboard the Rosetta mission. In his final years and months, Michel was the principal editor and architect for the book *Comets II*, with the goal of setting the foundation for cometary science during the next decade. Michel often remarked that he wanted this book to be his gift to the world of planetary science, but little did we know that *Comets II* would be the last of his many gifts to our field. Yet this book is a fitting way that Michel continues to share with us his joy of life and his penetrating curiosity. We have lost a great man and a good friend. He will be sorely missed.

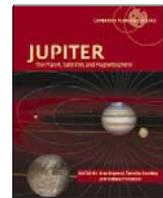
# NEW AND NOTEWORTHY

These products are available from booksellers or the publisher listed.  
Please note that the LPI does not offer these products through its Order Department.

## BOOKS

**Jupiter: The Planet, Satellites and Magnetosphere.** Edited by Fran Bagenal, Timothy E. Dowling, and William B. McKinnon. Cambridge University Press, 2005. 748 pp., Hardcover, \$150.00. [www.cup.org](http://www.cup.org)

This comprehensive volume summarizes current knowledge of the jovian system in view of recent scientific developments regarding the Galileo spacecraft, the Galileo probe, the Cassini spacecraft, the Hubble Space Telescope, and numerous groundbased and theoretical studies. Chapters by recognized authorities cover all aspects of Jupiter, its satellites, and its magnetosphere. This complete and up-to-date summary of our current understanding of the entire Jupiter system comes with a CD of supplementary illustrations.



**Europa: The Ocean Moon.** By Richard Greenberg. Springer, 2005. 380 pp., Hardcover, \$89.95. [www.springeronline.com](http://www.springeronline.com)

This book tells the story of the Galileo spacecraft probe to Jupiter's moon, Europa. It provides a detailed description of the physical processes, including the dominating tidal forces that operate on Europa, and includes a comprehensive tour of Europa using images taken by Galileo's camera. The book reviews and evaluates the interpretative work carried out to date, providing a philosophical discussion of the scientific process of analyzing results and the pitfalls that accompany it. It also examines the astrobiological constraints on its possible biosphere and implications for future research, exploration, and planetary biological protection. Europa: The Ocean Moon provides a unique understanding of the Galileo images of Europa, discusses the theory of tidal processes that govern its icy ridged and disrupted surface, and examines in detail the physical setting that might sustain extraterrestrial life in Europa's ocean and icy crust.

**Moon Rush: Improving Life on Earth with the Moon's Resources.** By Dennis Wingo. Apogee Books, 2004. 280 pp., Paperback, \$24.95. [www.cgpublishing.com](http://www.cgpublishing.com)

If by some magic process humanity was able to go to the stars tomorrow and find habitable worlds, we would probably want to design a society based upon modern technology. We can't do this, but we can look at our Earthbound society and think about how to redesign it so that it will work better. This book examines how the exploration of space, specifically a commercial base on the Moon and Mars, would transform our economies on Earth as surely as the discovery of the New World transformed the old world of Europe. From platinum group metals for fuel cells, to manufacturing high-tech metals and robots, to the building of a fusion reactor, the Moon holds great promise for a high-tech manufacturing future. This book takes a look at and imagines how a world with such resources could be designed for our future.

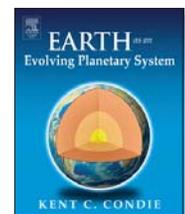


**Lunar Prospector: Against All Odds.** By Alan Binder. Ken Press, 2005. 1181 pp., Paperback, \$44.95. [www.kenpress.com](http://www.kenpress.com)

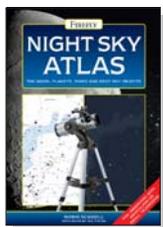
*Lunar Prospector: Against all Odds* is Principal Investigator Dr. Alan Binder's personal account of the triumphs, defeats, inside politics, and ultimate success enjoyed and endured during the 13 years it took to accomplish the Lunar Prospector mission. The Lunar Prospector spacecraft launched to the Moon in 1998 was the first space mission conceived and managed by a scientist who came from outside NASA and associated aerospace industries. Binder describes every aspect of this highly successful mission, holding nothing back, and providing both a technical and insightful personal look into the factors that shape our space program.

**Earth as an Evolving Planetary System.** By Kent C. Condie. Elsevier Academic Press, 2005. 350 pp., Paperback, \$59.95. [books.elsevier.com](http://books.elsevier.com)

Author Kent Condie synthesizes data from the fields of oceanography, geophysics, planetology, and geochemistry to examine the key topics and questions relating to the evolution of Earth's crust and mantle. This volume provides a substantial update to Condie's established text, *Plate Tectonics and Crustal Evolution, Fourth Edition*. It emphasizes the interactive nature of various components of the Earth system on timescales of tens to hundreds of millions of years, and how these interactions have affected the history of the atmosphere, oceans, and biosphere.



## NEW AND NOTEWORTHY (continued)

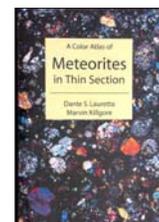


**Night Sky Atlas: The Moon, Planets, Stars and Deep Sky Objects.** By Robin Scagell with maps by Wil Tirion. Firefly Books, Ltd., 2005. 128 pp., Paperback, \$29.95. [www.fireflybooks.com](http://www.fireflybooks.com)

Here is a practical guide to binocular and small-telescope observing and an ideal portable reference for backyard astronomers. This atlas combines clear, accurate star maps with reliable and informative text. The whole sky is presented in a series of six maps, showing stars down to magnitude 5.5, all visible with binoculars or a small telescope. Opposite each map is a photorealistic image that shows how the same portion of sky looks to the naked eye, allowing less-experienced observers to quickly find specific objects of interest. Sturdy binding makes it suitable for outdoor use, and cover flaps can be used as pagemarkers. Other features include 40 large-scale constellation charts, a full set of seasonal charts, maps of the Moon and the planets, deep sky maps identifying double stars and nebula, and more.

**A Color Atlas of Meteorites in Thin Section.** By Dante Lauretta and Marvin Killgore. Southwest Meteorite Press, 2004. 305 pp., Hardcover, \$98.00. [www.meteoritelab.com](http://www.meteoritelab.com)

This atlas is the first book to show every known stone meteorite classification in thin section. Each petrologic type is shown in six high-quality digital images: an overview in cross-polarized and plane-polarized light, and low-magnification views in plane-polarized, cross-polarized, and reflected light, along with backscattered electron (BSE) images. This new publication from the Southwest Meteorite Laboratory is a unique reference book that provides snapshots of the enormous diversity of meteorite types.



## CD-ROM



**Lunar Sourcebook: A User's Guide to the Moon on CD-ROM** Lunar and Planetary Institute, \$20.00 (price subject to change without notice) [www.lpi.usra.edu](http://www.lpi.usra.edu)

This CD-ROM contains a digital reproduction of *Lunar Sourcebook: A User's Guide to the Moon* (Cambridge University Press, 1991), edited by G. H. Heiken, D. T. Vaniman, and B. M. French. The *Lunar Sourcebook*, a concisely presented collection of data gathered during the American and Soviet missions, is a complete one-volume reference encyclopedia of scientific and technical information about the Moon and provides a thorough introduction to lunar studies and a summary of information about the nature of the lunar environment. It explores the formation and evolution of the Moon's surface; the chemical and mineralogical nature of lunar rocks and soils; and scientific knowledge about the nature, origin, and history of the Moon. Now available in a CD-ROM version, this important work is a convenient, accessible reference for planning the future study of the Moon and the eventual use of the Moon by spacefaring humans.

## DVD

**Welcome to Mars DVD.** Presented by NOVA/WGBH, 2005. 60 minutes, \$19.95. [www.shopwghb.org](http://www.shopwghb.org)

On January 3, 2004, a tiny rover named Spirit crash-landed on the dusty surface of Mars and sent its first message home. The behind-the-scenes engineering story leading up to that landing was captured by NOVA in its popular documentary Mars, Dead or Alive. In this highly anticipated sequel, the adventures of Mars rovers Spirit and Opportunity continue. Once again, NOVA's producers enjoyed unprecedented access to the mission scientists at JPL as they wrestled with the technical crises that soon beset the rovers. The race to collect data provided a challenge for the engineers as they struggled to keep their earthly lives in synch with the longer day/night cycle of the Red Planet. In the end, the evidence adds up, and after 40 years of speculation, NASA finally announces solid proof that Mars was once awash in water. *Welcome to Mars* presents a compelling inside story of triumph and technical ingenuity, full of scientific and human drama, with stunning fresh images from an alien world.



## ONLINE RESOURCE

**GeoScienceWorld (GSW).** [www.geoscienceworld.org](http://www.geoscienceworld.org)

GeoScienceWorld (GSW) is a nonprofit corporation formed by a group of leading geoscientific organizations for the purpose of making geoscience research and related information easily and economically available via the Internet. The founders have worked together with other geoscience societies and university presses to develop an electronic research resource that is unprecedented in this field of science. GSW delivers a uniquely valuable aggregation of the full text of high-impact geoscience journals, and eventually will include a wide variety of other vital research information such as maps, books, and geoscience digital data. Subscription rates are available from GeoScienceWorld.



## For Kids!!



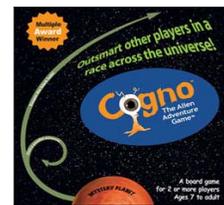
**Inflatable EarthBall.** Orbis. 16-inch diameter inflatable with global handbook, \$15.00.

[www.earthball.com](http://www.earthball.com)

The new 16-inch-diameter Orbis EarthBalls are now available! Be the first on your block to explore a brand new world! Featuring the colorful NASA satellite imagery, each EarthBall displays NiteGlow Cities, allowing you to observe the world's cities glowing brightly at night. Every EarthBall also comes with a 20-page "global handbook," chock full of games, activities, and resources for Earth adventurers of all ages. These affordable "reality globes," now available in the 16-inch-diameter size, will soon be produced in additional larger and smaller sizes.

**Cogno: The Alien Adventure Game.** DoubleStar, LLC, 2004. Game board, game pieces, and rule book, \$29.95. [www.cogno.com](http://www.cogno.com)

Choose any of eight wild-looking aliens with different capabilities and personalities and move around the colorful game board that features mystery planets, a black hole, a time tunnel, and a space elevator. Try to answer science questions on "Chaos Cards" using your imagination and the rest of your brain to figure them out. Leave the main board and enter a parallel universe where anything can happen. Move forward or backward whenever you choose to help yourself or slow down other players. With luck and some good thinking, you can win fuel cells and high-tech gear to help your alien survive the mystery planets and win the game! Ages 7 and up.



**SCIENCE CARDS WITH FLAIR, FROM PHLARE!** **Hubble Science Cards.** Forty-eight cards, \$8.99; **Mars Science Cards and Mars Map.** Twenty-five cards and map, \$10.99; **Saturn Science Cards.** Fifteen cards, \$5.00; all from Phlare, Inc. [www.phlare.com](http://www.phlare.com)

Phlare has combined incredible imagery with current and historical science from the Hubble Space Telescope and planetary missions to create these colorful science card sets. Presented in an educational question-and-answer format, these card sets make terrific gifts for space fans of all ages! The Mars Science Card set comes with a folded 18-inch x 24-inch map of Mars, full-color on both sides and complete with a wealth of information about the Red Planet. Packages combining various card sets are available.

# CALENDAR 2005

Information was valid as of this issue's publication and is subject to change without notice.  
For more information see the Web sites listed.

## May

- 2-5 2005 May Symposium: A Decade of Extrasolar Planets Around Normal Stars, Baltimore, Maryland.  
[http://www.stsci.edu/institute/conference/may\\_symp](http://www.stsci.edu/institute/conference/may_symp)
- 4-6 12th Latin American Congress on Geology, Quito, Ecuador  
<http://12lcg.cigmy.org/>
- 12-13 Fifth Canadian Space Exploration Workshop, Quebec, Canada.  
<http://www.space.gc.ca/asc/eng/events/2005/csew5.asp>
- 15-18 Halifax 2005, Halifax, Nova Scotia, Canada.  
<http://www.dal.ca/~hfx2005/welcome.htm>
- 16-20 Massive Star Birth: A Crossroads of Astrophysics, Acireale, Italy.  
<http://www.arcetri.astro.it/~iaus227/splash.html>
- 17-20 ISPRS Workshop: High Resolution Earth Imaging for Geospatial Information, Hannover, Germany.  
[http://www.ipi.uni-hannover.de/ISPRS\\_workshop\\_05/](http://www.ipi.uni-hannover.de/ISPRS_workshop_05/)
- 19-20 Planetary Geology on Mars, Pasadena, California.  
<http://www.jpl.nasa.gov/events/lectures/may05.cfm>
- 20-25 15th Annual Goldschmidt Conference: A Voyage of Discovery, Moscow, Idaho.  
<http://www.the-conference.com/2005/gold2005/index.php>
- 22-26 15th IAA Humans in Space Symposium, Graz, Austria.  
<http://www.uni-graz.at/space2005/>
- 23-27 AGU Joint Assembly, New Orleans, Louisiana.  
<http://www.agu.org/meetings/sm05/>
- 24-28 Astrobiology and the Origins of Life, Hamilton, Ontario.  
<http://origins.mcmaster.ca/astrobiology/>
- 29-June 2 206th Meeting of the American Astronomical Society, Minneapolis, Minnesota.  
[http://www.aas.org/meetings/meeting\\_dates.html](http://www.aas.org/meetings/meeting_dates.html)

## June

- 2-3 Workshop on Oxygen in Asteroids and Meteorites, Flagstaff, Arizona.  
<http://www.lpi.usra.edu/meetings/am2005/>
- 5-8 Planetary and Terrestrial Mining Science Symposium, Sudbury, Ontario.  
<http://www.ptmss.com/>

- 16-17 Astrobiology in the Arctic, Pasadena, California.  
<http://www.jpl.nasa.gov/events/lectures/jun05.cfm>
- 20-24 Astrophysical Sources of High Energy Particles and Radiation, Turon, Poland.  
<http://www.ncac.torun.pl/~torun05/servlet/ashepr>
- 20-24 5th International Scientific Conference on the Global Energy and Water Cycle, Orange County, California.  
<http://www.gewex.org/5thconf.htm>
- 26-July 1 Origins of the Solar System, New London, Connecticut.  
<http://www.grc.uri.edu/programs/2005/origins.htm>
- 27-July 1 3rd International Planetary Probe Workshop, Attica, Greece.  
<http://web.ims.demokritos.gr/IPPW-3>

## July

- 11-14 Workshop on the Role of Volatiles and Atmospheres on Martian Craters, Laurel, Maryland.  
<http://www.lpi.usra.edu/meetings/volatiles2005/>
- 11-14 International Conference on Environmental Systems and European Symposium on Space Environmental Control Systems, Rome, Italy.  
<http://www.sae.org/events/ice/>
- 11-15 Ultra-Relativistic Jets in Astrophysics: Observations, Theory, Simulations, Banff, Alberta, Canada.  
<http://www.capca.ucalgary.ca/meetings/banff2005/poster.html>
- 11-17 Kobe International School of Planetary Sciences 2005: Origin of Planetary Systems, Hyogo, Japan.  
[http://www.kobe-u.ac.jp/21COEPS/SCHOOL/2005/2005\\_ischool.html](http://www.kobe-u.ac.jp/21COEPS/SCHOOL/2005/2005_ischool.html)
- 21-22 Comet Exploration and Research, Pasadena, California.  
<http://www.jpl.nasa.gov/events/lectures/jul05.cfm>
- 25-29 Michelson Summer Workshop: Discovering New Worlds Through Astronomy, Pasadena, California.  
<http://msc.caltech.edu/workshop/2005/>
- 26-29 The 9th Asian-Pacific IAU Meeting 2005, Bali, Indonesia.  
<http://www.as.itb.ac.id/APRIM2005/cover.htm>

## August

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- 7–12 IAU Symposium No. 229, Asteroids, Comets and Meteors, Rio de Janeiro, Brazil.  
<http://www.on.br/acm2005/>
- 8–11 Earth System Processes 2, Calgary, Alberta.  
<http://www.geosociety.org/meetings/esp2/>
- 15–19 International Astronomical Union Symposium No. 230, Populations of High Energy Sources in Galaxies, Dublin, Ireland.  
<http://www.dunsink.dias.ie/IAUS230/menu.html>
- 21–26 Engineering Sciences for Space Exploration, Les Diablerets, Switzerland.  
<http://www.grc.uri.edu/programs/2005/space.htm>
- 22–26 Dynamic Planet 2005, Cairns, Australia.  
<http://www.dynamicplanet2005.com/>
- 30–Sept. 1 Space 2005, Long Beach, California.  
<http://www.aiaa.org/content.cfm?pageid=230&lumeetingid=1181>

## September

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- 4–9 36th Annual Meeting of the Division for Planetary Sciences, Cambridge, England.  
<http://www.dps2005.com/>
- 12–16 The Dynamic Sun: Challenges for Theory and Observations, Leuven, Belgium.  
<http://wis.kuleuven.be/cpa/spm11.php>
- 12–16 68th Annual Meeting of the Meteoritical Society, Gatlinburg, Tennessee.  
<http://www.lpi.usra.edu/meetings/metsoc2005/>
- 15–16 Mars Exploration – Past, Present, and Future, Pasadena, California.  
<http://www.jpl.nasa.gov/events/lectures/sep05.cfm>
- 15–18 International Meteor Conference 2005, Oostmalle, Belgium.  
<http://www.imo.net/imc2005/>
- 19–22 Workshop on Oxygen in the Earliest Solar System, Gatlinburg, Tennessee.  
<http://www.lpi.usra.edu/meetings/ess2005/>
- 26–30 Dust in Planetary Systems, Kaua'i, Hawai'i.  
<http://www.lpi.usra.edu/meetings/dust2005/>
- 26–30 The X-Ray Universe 2005, Madrid, Spain.  
<http://www.congrex.nl/05a11/>

## October

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- 3–7 Direct Imaging of Exoplanets: Science Techniques, Nice, France.  
<http://pleiades.unice.fr/colloqueUAI/>
- 11–13 Low-Cost Planetary Missions, Kyoto, Japan.  
<http://iclcpm2005.isas.jaxa.jp/>
- 16–19 56th International Astronomical Congress, Fukuoka, Japan.  
<http://www.iac2005.org/welcome/index.html>
- 16–19 2005 Geological Society of America Annual Meeting, Salt Lake City, Utah.  
<http://www.geosociety.org/meetings/2005/>
- 17–21 International Council for Science 28th General Assembly, Suzhou and Shanghai, China.  
<http://www.icsu.org/>
- 21–23 European Low Gravity Research Association Biennial Meeting and General Assembly, Santorini, Greece.  
[http://www.elgra.org/Bulletin/Santorini-2005/Meeting\\_2005.htm](http://www.elgra.org/Bulletin/Santorini-2005/Meeting_2005.htm)
- 24–28 Protostars and Planets V, Waikoloa, Hawai'i.  
<http://www.lpi.usra.edu/meetings/ppv2005/>
- 25–28 Space Resources Roundtable VII: LEAG Conference on Lunar Exploration, League City, Texas. <http://www.lpi.usra.edu/meetings/leag2005/>

## November

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- 7–11 Relativistic Astrophysics and Cosmology, Munich, Germany.  
<http://www.mpe.mpg.de/~e05>

## December

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- 5–9 AGU Fall Meeting, San Francisco, California.  
<http://www.agu.org/meetings/fm05/>

# PUBLICATIONS FROM LPI

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<http://www.lpi.usra.edu/store/products.cfm>

## EDUCATIONAL PRODUCTS

Quantity	Code	Title	Price	Total
	C-SSRG-2	SPACE SCIENCE REFERENCE GUIDE, 2ND EDITION <b>(CD-ROM)</b> <i>FREE SHIPPING!</i>	\$0.00	
	R-SPEC-2	ALTA REFLECTANCE SPECTROMETER ( <b>version 2, 11 colors</b> ) A simple classroom instrument designed to help students learn about light, color, and spectroscopy. The ALTA handheld spectrometer weighs only 9 ounces. <b>(scientific instrument)</b>	\$160.00	
	B-RSPECTG	ALTA REFLECTANCE SPECTROMETER CLASSROOM LESSONS <b>(book)</b>	\$25.00	
	C-RSPECTG	ALTA REFLECTANCE SPECTROMETER CLASSROOM LESSONS <b>(CD-ROM)</b>	\$5.00	
	C-CLA	CONSOLIDATED LUNAR ATLAS <b>(CD-ROM)</b>	\$10.00	
	C-LOPA	DIGITAL LUNAR ORBITER PHOTOGRAPHIC ATLAS <b>(DVD)</b>	\$10.00	
	LSB	LUNAR SOURCEBOOK <b>(CD-ROM)</b>	\$20.00	

## OTHER PUBLICATIONS

AVAILABLE FOR THE COST OF SHIPPING AND HANDLING

	CB-1063	THIRD ANNUAL HEDS-UP FORUM <b>(book)</b>	\$0.00	
	CB-1084	FORUM ON INNOVATIVE APPROACHES TO OUTER PLANETARY EXPLORATION 2001–2002 <b>(book)</b>	\$0.00	
	CB-1095	CONFERENCE ON THE GEOPHYSICAL DETECTION OF SUBSURFACE WATER ON MARS <b>(book)</b>	\$0.00	
	CB-1106	FOURTH ANNUAL HEDS-UP FORUM <b>(book)</b>	\$0.00	
	CB-1129	SOLAR SYSTEM REMOTE SENSING <b>(book)</b>	\$0.00	
	CB-1134	UNMIXING THE SNCs: CHEMICAL, ISOTOPIC, AND PETROLOGIC COMPONENTS OF THE MARTIAN METEORITES <b>(book)</b>	\$0.00	
	CB-1152	RASC-AL: 2002 ADVANCED CONCEPT DESIGN PRESENTATION <b>(book)</b>	\$0.00	
	CB-1182	WORKSHOP ON COMETARY DUST IN ASTROPYSICS <b>(book)</b>	\$0.00	
	CB-1195	WORKSHOP ON EUROPA'S ICY SHELL: PAST, PRESENT, AND FUTURE <b>(book)</b>	\$0.00	
	CB-1203	OXYGEN IN THE TERRESTRIAL PLANETS <b>(book)</b>	\$0.00	
	C-33	LPSC XXXIII ABSTRACTS <b>(CD-ROM)</b>	\$0.00	
	C-1184	THIRD INTERNATIONAL CONFERENCE ON MARS POLAR SCIENCE AND EXPLORATION <b>(CD-ROM)</b>	\$0.00	
	C-34	LPSC XXXIV ABSTRACTS <b>(CD-ROM)</b>	\$0.00	
	C-35	LPSC XXXV ABSTRACTS <b>(CD-ROM)</b>	\$0.00	
	C-1088	ELEVENTH ANNUAL V. M. GOLDSCHMIDT CONFERENCE <b>(CD-ROM)</b>	\$0.00	
	C-1164	SIXTH INTERNATIONAL CONFERENCE ON MARS <b>(CD-ROM)</b>	\$0.00	
	C-1167	THIRD INTERNATIONAL CONFERENCE ON LARGE METEORITE IMPACTS <b>(CD-ROM)</b>	\$0.00	
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	CB-1224	SPACE RESOURCES ROUNDTABLE VI <b>(book)</b>	\$0.00	
	CB-1231	WORKSHOP ON RADAR INVESTIGATIONS OF PLANETARY AND TERRESTRIAL ENVIRONMENTS <b>(book)</b>	\$0.00	
	C-36	LPSC XXXVI ABSTRACTS <b>(CD-ROM)</b>	\$0.00	

