

LUNAR NEWS

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VISITING THE LUNAR SAMPLE LABORATORY FACILITY



See page 4

CAPTEM Meeting – October 17–18, 2001

Lunar News Mission

The purpose of "Lunar News" is to provide a newsletter forum for facts and opinions about lunar sample studies, lunar geoscience, and the significance of the Moon in solar system exploration.

Editor's Notes

"Lunar News" is published by the Astromaterials Acquisition and Curation Office, Lyndon B. Johnson Space Center (JSC) of the National Aeronautics and Space Administration (NASA). It is sent free to all interested individuals. To be included on the mailing list, write to the address below. Please send to the same address any comments on "Lunar News" or suggestions for new articles.

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Curator's Comments

Gary Lofgren
NASA JSC

Another year has passed in the ever-changing world of curation. Our reorganization has occurred and the best evidence of that is the mail code, now ST, formerly SN; nothing is official until the code changes. See the article by Carl Allen in this issue about the new structure and the new efforts underway. One of the changes not discussed by Carl is regarding educational materials. Marilyn Lindstrom, formerly the meteorite curator, is now in charge of educational materials, including requests for lunar and meteorite thin section packages and educational disks. Requests should now be sent to her. We had our annual center wide open house Saturday, August 25. I spent my stint in the lunar viewing room talking to the visitors. I am always amazed at the enthusiasm that they have to learn about the rocks and the Apollo missions. They are always surprised that we are still studying the rocks.

Requests for lunar samples for scientific study remain strong. We have sent out 421 samples from the last two rounds of allocations in October and March. The CAPTEM (Curation Analysis Planning Team for Extraterrestrial

Materials) will meet in mid-October 2001. The meeting in March of next year will be a couple of weeks earlier because the Lunar



and Planetary Science Conference (LPSC) is earlier. The requests will be due February 6, 2002.

A long-term display sample was recently sent to the Lodestar Astronomy Center at the New Mexico Museum of Natural

History in Albuquerque. A sample was sent earlier this year to the Western Australian Museum of Natural Science in Perth, Australia, and to the National Space Science Center in Leicester, England. These most recent display samples utilize our new case design. This design will facilitate completion of future display samples.



Visiting the Lunar Sample Laboratory Facility

Kay Tobola

Scientists who have done research on lunar samples, students who have seen moon rocks on display in museums, NASA employees who worked

on the missions, and people who remember where they were on July 20, 1969, all share a connection to the lunar samples returned during the

Apollo era. The Lunar Sample Laboratory Facility is the unique place where these geologic samples are physically protected,

environmentally preserved, and scientifically processed. Located in Lyndon B. Johnson Space Center (JSC) building 31N, it is a popular place that visiting scientists often request to see. Certainly there is the cool factor of being where the samples are stored, of seeing the rocks being readied for shipment to research sites, and of talking with the people who work with the rocks daily. These samples are tangible evidence of an exciting time in human space exploration. In addition, the visitor sees firsthand the efforts taken to keep the samples ready for continuing research. The work environment and procedures are observable and consistent with the present scientific importance of the samples.

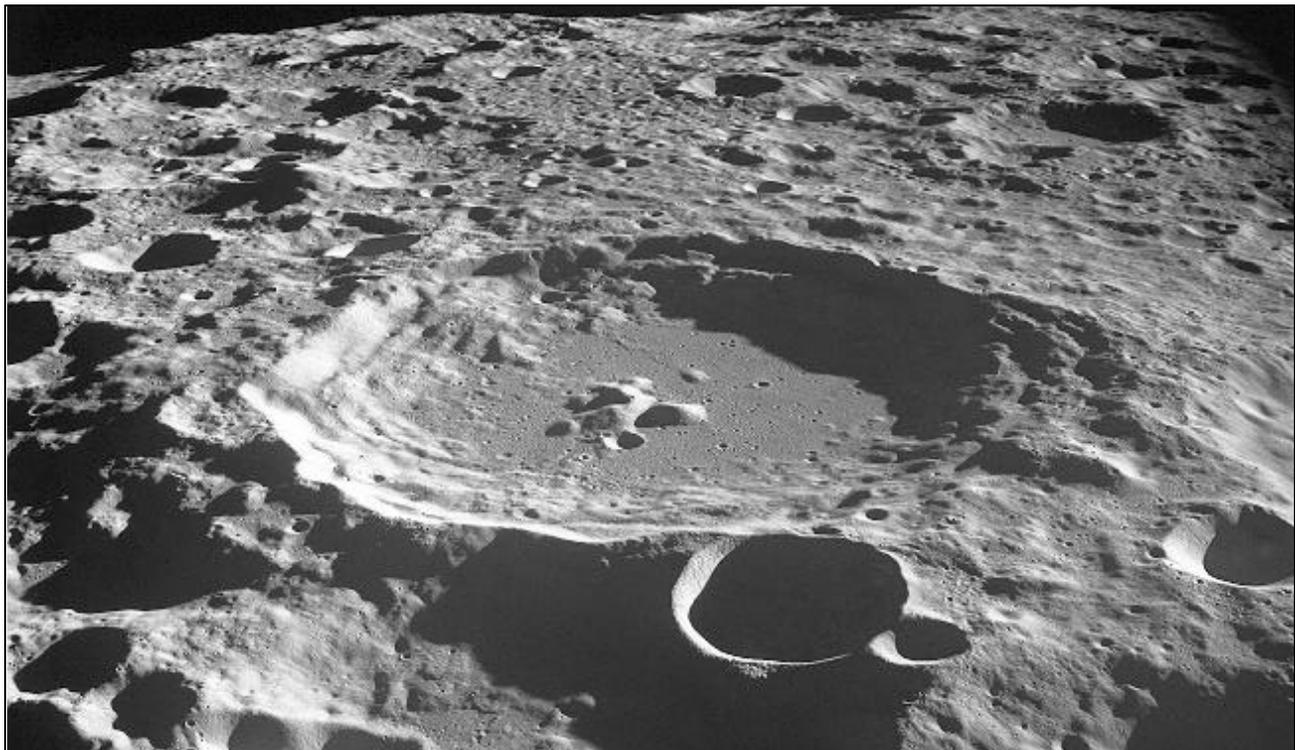
The Lunar Sample Laboratory

Facility can be visited in two ways. Most accessible and easiest is a “virtual tour” online. The curator’s tour Web site is available to everyone all the time. A visitor can see the labs and the people who work here, as well as lunar samples. This well-designed tour conveys the feeling of being here. The information is complete with important details and friendly anecdotes. Just curious or planning a trip to JSC, this is the first and most available way to see the Lunar Sample Lab. The Web site is <http://curator.jsc.nasa.gov/lunar/tour/welcome.htm>.

Scientists visiting JSC are encouraged to see the Lunar Sample Laboratory Facility using the Visitor Viewing Area. This room is attached to

but outside of the Pristine Sample Lab (PSL). Through viewing windows visiting scientists are able to see the pristine lab, core and saw area, and air showers.

Beyond the PSL, the sample vault can be seen. A visitor gets a sense of the workspace and precautions taken to keep the samples uncontaminated and ready for researchers. People closely associated with the lab conduct the tours. A visiting scientist may have the opportunity to talk with employees, such as Andrea Mosie, Linda Watts, or Carol Schwarz, who have been working in the Lunar Sample Laboratory since it was built in 1979. If you have worked with a lunar sample, they probably had a hand—a gloved hand—in getting it to you. They



answer science and technical questions, give a historical perspective, and share an enthusiasm about the work they do. The tour may be conducted by curation managers, Carl Agee, Carl Allen, or Gary Lofgren, who are ultimately responsible for the maintenance of the facility and its impact on the scientific community. Education and public outreach staff, Marilyn Lindstrom (former JSC meteorite curator) and Jackie Allen, also conduct these tours. The viewing area

includes an exhibit that gives historical perspective and the scientific importance of the work done here. Using the Visitor Viewing Area allows an in person tour, up close and personal, without the cost of time and materials that is required when visitors enter the lab. Please note that this area is not handicap accessible. These tours are available for visiting scientists on request by contacting Gary Lofgren

at 281-483-6187. Non-U.S. citizens need to request a tour at least six weeks ahead of time. Lunar samples are a national treasure; no cost amount can be associated with them. The Lunar Sample Laboratory Facility is the place where these treasures are kept safe and ready for future scientific investigation. A visit online or in person is a rewarding experience. Visiting scientists, treat yourselves!



Astromaterials Acquisition and Curation at JSC

Carlton Allen
Astromaterials Curator
Manager, Astromaterials Acquisition and Curation Office

The Astromaterials Acquisition and Curation Office was established at the Lyndon B. Johnson Space Center (JSC) on July 1, 2001. This new organization replaces the Office of the Curator, and the title reflects a renewed emphasis on extraterrestrial samples at NASA and JSC.

The goal of Astromaterials Acquisition and Curation is to support the international planetary science community through:

- **Curation of current extraterrestrial sample collections**

The current collections are comprised of the Apollo lunar samples, meteorites collected in Antarctica by the joint NASA/National Science Foundation/Smithsonian Institution Antarctic Search for Meteorites program, cosmic dust collected by high-altitude aircraft, and space-exposed hardware.

- **Curation of samples from upcoming spacecraft missions**

These missions include two that have already launched and one that is planned for launch later in the decade. JSC curatorial personnel are active participants in the science teams for each of these missions.

- **Forward planning efforts for all funded and proposed sample return missions**

A number of sample return missions are in the pre-proposal stage or on NASA's future timeline. JSC curatorial personnel are active in the planning for each of these. As new sample return missions are conceived or proposed, we will continue to offer curatorial support.

- **Focused research and development in support of current and future sample curation**

JSC curatorial personnel are engaged in a wide-ranging research and development program that includes robotic sample curation, advanced surface treatments, detection of trace-level organic and microbial contamination, and an unprecedented combination of cleanliness and biosafety.

Curation of Current Extraterrestrial Sample Collections (July 2000 – July 2001)

Lunar Samples

Gary Lofgren – Curator

Personnel in the Lunar Sample Laboratory continued to prepare and distribute lunar rock and soil to the research community. This year they allocated 376 samples and 50 electron microprobe mounts to scientists in 19 groups conducting state-of-the-art geochemical analysis.

The Lunar Sample Laboratory has operated effectively since its opening in 1979. This year we initiated an upgrade of the liquid nitrogen system and studies to assess the material condition of the lab monitoring system and infrastructure.

Antarctic Meteorites

David Mittlefehldt – Acting Curator

Personnel in the Antarctic Meteorite Laboratory allocated 239 samples and 101 thin sections to scientists in 34 research groups. Laboratory personnel classified and described 661 new meteorites from previous Antarctic collecting efforts and processed 740 samples collected by the 2000-2001 field team.

Assessment of laboratory air quality and particle counts indicated that the existing air handling system had degraded to an unacceptable degree. Laboratory personnel and JSC contractors designed and installed a new air handler and filtration system that promises to give the laboratory a significantly cleaner atmosphere.

Cosmic Dust

Michael Zolensky – Curator

Personnel in the Cosmic Dust Laboratory allocated 122 interplanetary dust particles and 1 sample collection surface to scientists in 7 research groups. Collection flights by two NASA aircraft are continuing, and new sample collectors are processed in the laboratory periodically.

The air handling system in the Cosmic Dust Laboratory was upgraded in the same project with the Antarctic Meteorite Laboratory.

Space-Exposed Hardware

Michael Zolensky – Curator

Two pieces of a thermal protective blanket from Mir were allocated to scientists in two research groups.

Curation of Samples from Upcoming Spacecraft Missions

Genesis

Donald Burnett – P.I.

Kimberly Cyr – Laboratory Manager

Genesis, a mission to collect samples of the solar wind, was

launched on August 8, 2001. It is due to return to Earth in 2004, becoming the first spacecraft to return extraterrestrial material since Apollo 17. The cleaning and assembly of collectors was conducted by JSC and Jet Pro-

pulsion Laboratory (JPL) personnel in two new JSC clean laboratories.

The Genesis Cleaning Laboratory has now been converted to use for advanced curation clean-

ing tests. The Assembly Laboratory will be used for disassembly, storage, and distribution of returned sample collectors to the research community.

Stardust

Donald Brownlee – P.I.
Michael Zolensky – Curation Lead

Stardust, a mission to collect particles ejected by a comet, was launched on February 7, 1999. The spacecraft is scheduled to encounter comet Wild 2 in January 2004 and collect comet dust particles in silica aerogel. Stardust will return to Earth in

January 2006, and the sample collectors will be brought to JSC for processing and curation.

Curatorial personnel plan to construct a dedicated laboratory in which the collectors will be disassembled. The comet particles will be documented, stored, and prepared for allocation in a second laboratory.

Muses-C

ISAS (Institute of Space and Aeronautical Science [Japan])
Michael Zolensky – Curation Lead

Muses-C is a Japanese mission designed to collect a small amount of material from the surface of an asteroid. The spacecraft is tentatively scheduled to launch in 2002 and return to Earth in 2007. Initial sample processing and curation will be conducted in Japan. Discussions are underway regarding a U.S. role in the curation and distribution of part of the sample, commencing in 2008.

Curation of a small (<1g) asteroid sample will require a dedicated glovebox in a clean laboratory. Several gloveboxes are currently available at JSC, as are laboratory spaces with a range of cleanliness levels.

Forward Planning Efforts for All Funded and Proposed Sample Return Missions

Sample Collection for Investigation of Mars (SCIM)

Laurie Leshin – Concept Lead
Michael Zolensky – Curation Lead

SCIM was one of the proposals recently selected by the Mars Scouts Program for a 6-month concept study. The Program has announced plans to release an Announcement of Opportunity in 2002 and select a mission to launch during 2007.

The SCIM mission concept involves a single pass through the Mars atmosphere, during which gas and suspended dust would be collected. The dust would be collected in aerogel, similar to the technology used by Stardust.

The samples would be returned to Earth in 2010.

The curatorial requirements for this mission are currently undefined. The minimum requirements, depending on planetary protection and sample size, are for dedicated gloveboxes in clean laboratories, similar to the requirements for Stardust.

Mars Sample Return

David Lindstrom – Curation Lead

The first mission to return samples from Mars is scheduled for launch no earlier than 2011, with samples arriving on Earth no earlier than 2014. This mission has not yet been funded, though considerable planning, research,

and development is currently underway.

JSC curatorial personnel are involved in many aspects of this planning effort. We are participating in the early phases of decision making for the sample receiving laboratory under the National Environmental Policy Act. We have worked on mission design studies, including the science implications of sample heating and return to Earth via the space shuttle. We assessed the impacts of a possible requirement for curation at sub-freezing temperatures. Several curatorial personnel have been active participants in the development of Planetary Protection protocols for Mars sample return.

Focused Research and Development in Support of Current and Future Sample Curation

Advanced Curation Laboratory

Carlton Allen – Curation Lead

JSC personnel have established a laboratory for testing technologies and procedures for the next generation of extraterrestrial samples. The first element of this laboratory, a glovebox containing a robotic arm, is in final acceptance testing. This equipment is designed to assess the usefulness

of a small, dexterous robot in the initial processing of rocks and soils. We will also learn to measure and minimize the robot's potential for both inorganic and organic contamination.

During the past year we developed advanced methods for cleaning sample processing tools and enclosures. We also studied the effects of a variety of finishes on the cleaning and sterilization of metal surfaces.

The curatorial laboratories currently employ ultrapure water for all cleaning operations. The water is processed in a complex system designed to remove particulate and biological contamination. We have instituted a program to monitor both organic and microbial contamination at the parts-per-billion level in the water supply. We are also developing methods to detect and quantify trace levels of organic contamination on metal surfaces.

Issues

The Astromaterials Acquisition and Curation Office faces a range of issues over the next decade. Four issues are currently being addressed through JSC and NASA Headquarters:

- **Lunar Samples – Security of Remote Sample Collection**

NASA policy requires that a portion of the lunar sample collection must be stored at a location remote from JSC. Currently 14 percent of the collection is stored at Brooks Air Force Base in San Antonio, Texas. Within the next 1 to 2 years the security status of these samples will change, as portions of the base are transferred to the city. This year we initiated a study of two options—maintaining the current level of sample security at Brooks Air Force Base or moving the samples to a new remote site.

- **Antarctic Meteorites – Increased Collections Effort**

The Antarctic Search for Meteorites collection effort will be significantly increased, starting with the 2001-2002 field season. The goal is to find additional Mars meteorites. The anticipated increase in workload and samples will require at least one new meteorite processor and increased laboratory space.

- **Stardust – New Laboratories**

Two dedicated laboratories will be required to support the return of comet samples in 2006. The physical space for the laboratories will be transferred to the Astromaterials Acquisition and Curation Office in early FY2002. We have initiated a preliminary design effort for these new laboratories.

- **Mars Sample Return – Decisions Required**

The first Mars Sample Return mission is planned to launch no earlier than 2011. However, the long lead times required by the National Environmental Policy Act and the NASA construction of facilities process require key decisions much earlier. Specifically, decisions from NASA Headquarters are needed within the next 1 to 2 years concerning the selection of laboratory management and the process for selecting the laboratory site.

10-Year Infrastructure Plan

The Astromaterials Acquisition and Curation Office is preparing a 10-Year Plan for maintaining and upgrading laboratory infrastructure to meet current and anticipated requirements. This plan will be complete in time for presentation to the NASA Headquarters Curation and Planning Team for Extraterrestrial Materials at their meeting in October 2001. The current draft of this plan includes the following elements:

- **Lunar Samples**

- Upgrade LN₂ system, monitoring alarms (in progress)
- Assess laboratory infrastructure (in progress)
- Enlarge returned sample storage capacity
- Maintain current security or relocate remote sample collection
- Upgrade air handling system (complete)
- Expand laboratory

- **Cosmic Dust**

- Upgrade air handling system (complete)

- **Genesis**

- Convert cleaning laboratory for advanced curation (complete)
- Upgrade assembly laboratory for sample processing and curation

- **Stardust**

- Set up sample processing and curation laboratory

- **MUSES-C**

- Set up sample processing and curation laboratory

- **Advanced Curation**

- Construct robotic glovebox laboratory (in progress)

- **Mars Sample Return**

- Participate in site selection, design, and construction of the sample receiving laboratory
- Participate in site selection, design, and construction of the sample curation laboratory

Employee Highlights

Another milestone has been reached in the life of one of our curatorial personnel. In June 2001, Lige (Bill) Williams, our friend and mechanical technician for many years, retired from Lockheed Martin. Bill, who played a great role in the Lunar Curatorial Laboratories, spent many years helping to maintain the laboratories and clean tools and containers. He worked in the



Bill Williams

Lunar Sample Facility (Pristine and Return Sample Laboratories), Meteorite Laboratory, Cosmic Dust and FOILS Laboratories, and Final Clean Laboratory. He also assisted with many other aspects of curation, whenever needed. Bill's 18 years at NASA JSC entailed service with Northrop Services, Inc., as well as Lockheed Martin.

During his "off work" time, Bill is a sportsman. For recreation, he cruises the waters in his 20-foot Bayliner Cruiser. He also works on automobiles.

Bill Williams was born in East Texas. He retired from the U.S. Navy in 1976 as Chief Engineman. He is the father of one son, Hardee, and two daughters, Gayle and Darla; and he is the grandfather of seven. He is retiring to enjoy the "better days of life," forgetting about clock watching and enjoying his leisure time.

We will miss Bill's singing at birthdays and other gatherings (not really), his laughter, and his presence. His expertise and years of knowledge will certainly be missed. We wish Bill all the best and good health in the coming years.

Lab Tours



Gary Lofgren and Dave Williams accompany representatives from the Canadian Space Agency and the Canadian Broadcasting Company on a tour of the labs. Pictured left to right, Kathleen Perry, Gary Lofgren, Diana Norman (JSC), Ruth Chicoine, John O'Brien, and Dave Williams.



Gary Lofgren and Antarctic explorers: Dr. Charles Bentley (University of Wisconsin), Dr. Richard Cameron (Webster University), Dr. Mario Giovinetto (Raytheon ITSS at NASA/GSFC), Dr. Charles Swithinbank (Scott Polar Research Institute/University of Cambridge), and Mary Dijoseph (NASA HQ). Group not pictured in order.



Left to right, Caroline N. Wannamaker (LPI intern), Graham Ryder (Principle Investigator), John Spray (UNB, Canada), and Kathryn MacCarthy (LPI intern).



Students from Clear Creek Independent School District, part of Space Center Houston's Lunar Growth program, tour the Lunar Sample Lab escorted by Charlie Galindo (HEI), far back right.



ASCANS (Astronaut Candidates)



More ASCANS



Jose "Carlos" Alvarez and Gary Lofgren



Mike Zolensky (Cosmic Dust Curator) and Elosia Seydler (JSC)



*Gary Lofgren, Andrea Mosie, and James Randi
(James Randi Educational Foundation)*



*Carl Agee, Gary Lofgren, Roy Estess (Acting Center Director),
Dave Williams, and Bill Parsons*



LPI interns



*Judy Allton (Lockheed Martin) and Jean-Louis Council
(Planetary Protection CNES)*

See a "virtual tour" online at <www-curator/jsc/nasa/gov>.
Scientists visiting JSC can request a tour by contacting Gary Lofgren at 281-483-6187.
For more information see
Visiting the Lunar Sample Laboratory Facility on page 4 of this newsletter.



How to Request Lunar Samples

NASA policies define lunar samples as a limited national resource and future heritage and require that samples be released only for approved applications in research, education, and public display. To meet that responsibility, NASA carefully screens all sample requests with most of the review processes being focused at the Lyndon B. Johnson Space Center (JSC). Individuals requesting a lunar sample should follow the steps given below for the appropriate category of sample.

1. RESEARCH SAMPLES (including thin sections)

NASA provides lunar rock, soil, and regolith-core samples for both destructive and non-destructive analysis in pursuit of new scientific knowledge. Requests are considered for both basic studies in planetary science and applied studies in lunar materials beneficiation and resource utilization.

A. The sample investigator demonstrates favorable scientific peer review of the proposed work involving lunar samples. The required peer review can be demonstrated in either of two ways: (1) A formal research proposal recommended by NASA's Lunar and Planetary Geosciences Review Panel (LPGRP) or an equivalent scientific peer-review panel, within the past three years; (2) Submittal of reprints of scientific articles, as published in peer-reviewed professional journals that directly pertain to the specific sample requested.

B. The investigator submits a written request specifying the numbers, types, and quantities of lunar samples needed, as well as the planned use of the samples. For planetary science studies, the sample request should be submitted directly to the Lunar Sample Curator at the following address:

Dr. Gary Lofgren
ST/Lunar Sample Curator
NASA/Johnson Space Center
Houston, TX 77058-3696 USA
Telephone: (281) 483-6187
Fax: (281) 483-5347
gary.e.lofgren1@jsc.nasa.gov

For new investigators, tangible evidence of favorable peer review (step A) should be attached to the sample request. Each new investigator should also submit a résumé.

Investigators proposing the application of new analytical methodologies (not previously applied to lunar samples) also should submit test data obtained for simulated lunar materials. New investigators who are not familiar with lunar materials should consult *Lunar Sourcebook: A User's Guide to the Moon* (G. Heiken, D. Vaniman, and B. M. French, Eds.; Cambridge University Press, 736 pp.; 1991; ISBN 0-521-33444-6) as the best available reference on the chemical and physical properties of lunar materials.

Investigators with access to the World Wide Web on the Internet also can find updated information at the following URL: <<http://www-curator.jsc.nasa.gov/curator/curator.htm>>. The home page cited above provides links to in-

formation of use to sample requestors.

C. The Lunar Sample Curator will research the availability of the requested samples and decide whether a unilateral action can be taken or an outside scientific review is required. Outside review is prescribed for all new investigators and for most established investigators except where returned (previously used) samples are being requested. For outside review, the Curator forwards the original request, with background information, to the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM), a standing committee of scientists who advise NASA on the care and use of lunar samples. CAPTEM checks for favorable peer review (step A) and appropriate sample selection (step B).

D. Given CAPTEM endorsement and concurrence by NASA Headquarters, the Lunar Sample Curator will prepare a Lunar Sample Loan Agreement for signature by the investigator's institution. The agreement includes a sample security plan that prescribes precautions to minimize prospects for theft or unauthorized use of lunar samples.

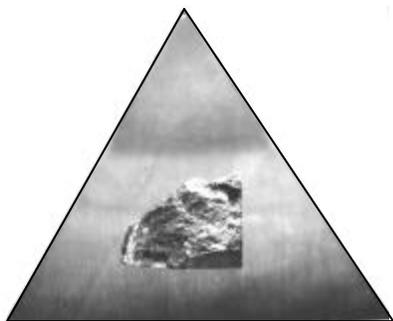
E. Upon receipt of the properly executed loan agreement, the Lunar Sample Curator prepares the authorized samples and sends them to the investigator. Quantities less than 10 grams can be sent directly by U.S. registered mail to domestic investigators. Shipments to foreign investigators are sent by U.S. diplomatic pouch mail to the American embassy

nearest the requestor's location. Quantities larger than 10 grams must be hand-carried by the investigator or his/her representative.

F. Continuation as a Lunar Sample Investigator. An investigator's privilege for retention and use of lunar samples is contingent upon continued good standing with the Office of the Curator. The investigator will remain in good standing by fulfilling the following obligations: (1) Maintenance of, and adherence to, the lunar sample loan agreement and security plan; (2) Timely cooperation with annual lunar sample inventory; (3) Timely cooperation with sample recalls.

2. PUBLIC DISPLAY SAMPLES

NASA provides for a limited number of rock samples to be used for either short-term or long-term displays at museums, planetariums, expositions, or professional events that are open to the public.



Requests for such display samples are administratively handled by the JSC Public Affairs Office (PAO). Requestors located in the United States should apply in writing to the following address:

Mr. Louis A. Parker
Lunar Sample Specialist
AP/Public Affairs

NASA/Johnson Space Center
Houston, TX 77058-3696
Telephone: (281) 483-8622
Fax: (281) 483-4876

Mr. Parker will advise successful applicants regarding provisions for receipt, display, and return of the samples. All loans will be preceded by a signed loan agreement executed between NASA and the requestor's organization. Mr. Parker will coordinate the preparation of new display samples with the Lunar Sample Curator.

3. EDUCATIONAL SAMPLES (disks and educational thin sections)

A. Disks

Small samples of representative lunar rocks and soils, embedded in rugged acrylic disks suitable for classroom use, are made available for short-term loan to qualified school teachers. Each teacher must become a certified user of the disks through a brief training program prior to receiving a disk. Educational sample disks are distributed on a regional basis from NASA field centers located across the United States. For further details, prospective requestors should contact the nearest NASA facility as follows:

IF YOU LIVE IN:

<i>Alaska</i>	<i>Nevada</i>
<i>Arizona</i>	<i>Oregon</i>
<i>California</i>	<i>Utah</i>
<i>Hawaii</i>	<i>Washington</i>
<i>Idaho</i>	<i>Wyoming</i>
<i>Montana</i>	

NASA Teacher Resource Center

Mail Stop 226-4
NASA Ames Research Center
Moffett Field, CA 94035-1000
Phone: (650) 604-5544

IF YOU LIVE IN:

<i>Connecticut</i>	<i>New Hampshire</i>
<i>Delaware</i>	<i>New Jersey</i>
<i>New York</i>	<i>Maine</i>
<i>Pennsylvania</i>	<i>Maryland</i>
<i>Rhode Island</i>	<i>Massachusetts</i>
<i>Vermont</i>	
<i>District of Columbia</i>	

NASA Teacher Resource Laboratory

Mail Code 130.3
NASA Goddard Space Flight Center
Greenbelt, MD 20771-0001
Phone: (301) 286-7206

IF YOU LIVE IN:

<i>Colorado</i>	<i>North Dakota</i>
<i>Kansas</i>	<i>Oklahoma</i>
<i>Nebraska</i>	<i>South Dakota</i>
<i>New Mexico</i>	<i>Texas</i>

NASA Teacher Resource Room

Mail Code AH-2
NASA Johnson Space Center
Houston, TX 77058-3696
Phone: (281) 483-0235

IF YOU LIVE IN:

Florida
Georgia
Puerto Rico
Virgin Islands

NASA Educators Resource Laboratory

Mail Code XA-D2
NASA Kennedy Space Center
Kennedy Space Center, FL
32899-0001
Phone: (321) 867-4444

IF YOU LIVE IN:

Kentucky
North Carolina
South Carolina
Virginia
West Virginia

NASA Teacher Resource Center
for Langley Research Center
Mail Stop 400
17 Langley Boulevard
Hampton, VA 23669-4033
Phone: (757) 864-9728

IF YOU LIVE IN:

Illinois *Minnesota*
Indiana *Ohio*
Michigan *Wisconsin*

NASA Teacher Resource Center
Mail Stop 7-4
NASA Glenn Research Center
21000 Brookpark Road
Cleveland, OH 44135-3191
Phone: (216) 433-2957

IF YOU LIVE IN:

Alabama *Louisiana*
Arkansas *Missouri*
Iowa *Tennessee*

NASA Teacher Resource Center
for Marshall Space Flight Center
Mail Stop CD60
Huntsville, AL 35812-0001
Phone: (256) 544-2849

IF YOU LIVE IN:

Mississippi

NASA Teacher Resource Center
Building 1100
Mail Code AA10
NASA John C. Stennis Space Center
Stennis Space Center, MS
39529-6000
Phone: (228) 688-2091

B. Thin Sections

NASA prepared thin sections of representative lunar rocks on rectangular 1- x 2-inch glass slides, with special safety frames, that are suitable for use in college and

university courses in petrology and microscopic petrography for advanced geology students. Each set of 12 slides is accompanied by a sample disk (described above) and teaching materials. The typical loan period is two weeks, including round-trip shipping time. Each requestor must apply in writing, on college or university letterhead, to the following address:

Dr. Marilyn Lindstrom
SR/Education Sample Curator
NASA/Johnson Space Center
Houston, TX 77058-3696
Telephone: (281) 483-5135
Fax: (281) 483-5347

For each approved user, the Curator will prepare a loan agreement to be executed between NASA and the requestor's institution prior to shipment of the thin-section package. □

