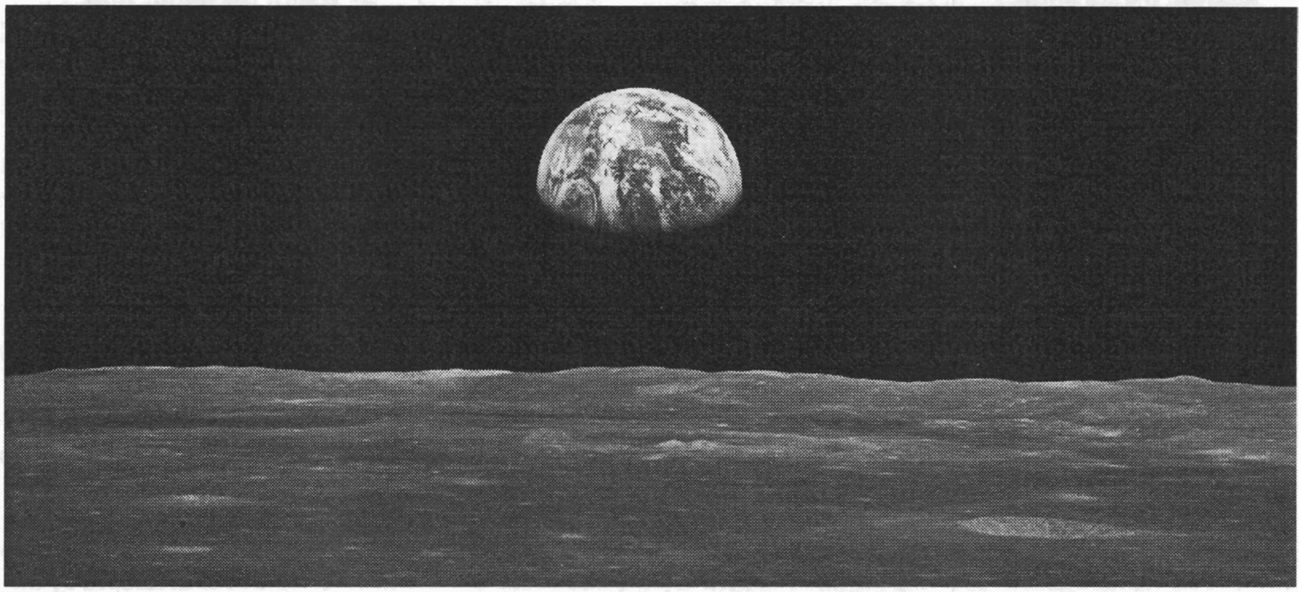
LUNAR *NEWS*

No. 58 February 1995



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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 Planetary Missions and Materials Branch, Earth Science & Solar System Exploration Division, Johnson Space Center of the National Aeronautics and Space Administration 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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Announcing a New World Wide Web Site!

by Claire Dardano* and Eileen Stansbery**
*Lockheed Eng. & Sci. Co.
**NASA/JSC

We are pleased to announce that Planetary Missions and Materials Branch personnel have developed a World Wide Web (WWW) Server for the Earth Science and Solar System Exploration Division of JSC (the server home page may be accessed with a Web browser, such as Mosaic, by opening the URL **http://www-sn.jsc.nasa.gov**). This server will provide information related to work within the division. Two nodes within the division Web Server have been developed by the Planetary Missions and Materials Branch for information relating to Planetary Missions (Exploration) and Planetary Materials (Curation).

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Correction

25 Years of Curating Moon Rocks

Lunar News, July 1994

LRL Director Persa R. Bell, known to everyone as "PR," was mistakenly identified as Peter R. Bell during editing. He should not be confused with Peter M. Bell who later served on the LSAPT subcommittee that oversaw the design and construction of the current lunar sample facility, JSC building 31N. *Lunar News* apologizes for any inconvenience to Persa R. Bell, Peter M. Bell and author Judy Allton. ❑

Jim Gooding
NASA/JSC

Curator's Comments

Changing Times: New Name Honors a Venerable Flame

With this issue of *Lunar News,* you will notice that our organization has changed from "Office of the Curator" to "Planetary Missions and Materials Branch" to reflect our recently expanded mission. In June 1994, our office was merged with the former Planetary Projects Office to create a new organization that not only looks after Moon rocks, and other extraterrestrial samples, but actively plans and supports further exploration of the Moon and Mars, including sample returns. I am pleased to continue as Lunar Sample Curator and also to serve as Chief of the new Planetary Missions and Materials Branch. Our new charter is as follows:

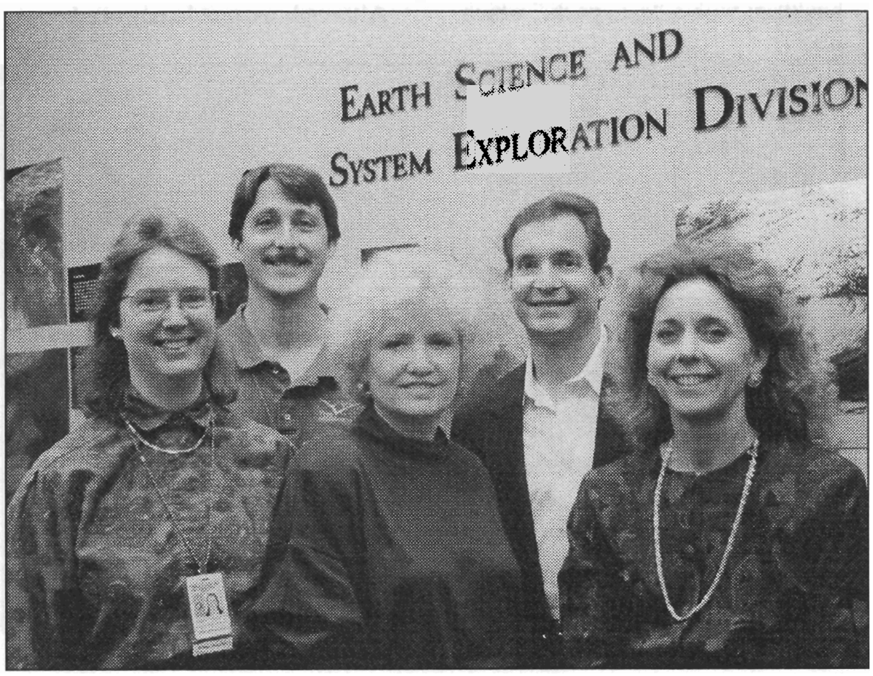
> The purpose of the Planetary Missions and Materials Branch is to support the planning and technological development of future human and robotic exploration missions beyond low Earth orbit and to provide for the collection, preservation, and study of extraterrestrial materials or materials returned from space.

Our Planetary Materials Team is well known to many of you; their names appear on page 2 of this newsletter. But for those of you who do not already know them, we proudly announce the newly received members of the Planetary Missions Team:

Nancy Ann Budden (payload science)
John Connolly (mission design)
Patricia Cox (secretary)
Bret Drake (mission design)
Kent Joosten (mission design)
David Kaplan (mission design)
Wendell Mendell (mission science)
Eileen Stansbery (mission science)

Chuck Meyer, a long-time lunar sample researcher and former associate sample curator, is now also helping to look after the interests of planetary geoscience on future lunar exploration missions. And please be aware that you can read about our work toward future exploration missions in *Beyond LEO*, the team's periodic newsletter. Whereas *Lunar News* focuses on the Moon, lunar samples and lunar geoscience, *Beyond LEO* addresses both the Moon and Mars and emphasizes mission designs. To find out more about *Beyond LEO*, contact John Connolly by one of the following pathways: Telephone: 713-483-5899; FAX: 713-483-5347; E-MAIL: connolly@snmail.jsc.nasa.gov.

For many of us, our new name honors an old flame: Exploring the planets and harvesting scientific knowledge from their geologic samples in ways that the *Apollo* missions taught us. ❑



Planetary Missions Team
From left to right: Eileen Stansbery, Bret Drake, Patricia Cox, David Kaplan, and Nancy Ann Budden. Not pictured: John Connolly, Kent Joosten, and Wendell Mendell.

New WWW Site
continued from page 2

The Planetary Missions home page is dedicated to providing information related to human exploration mission concepts beyond low Earth orbit (the exploration home page may be accessed from the URL **http://www-sn.jsc.nasa.gov/explore/explore.htm**). Available information includes space exploration news, documents, and images. An on-line reference library is available with full-text documents (both ASCII and MS-Word versions) of a variety of reports relating to exploration of the Moon and Mars. Fact sheets offer chronologies of missions to the Moon and Mars including mission name, country, date, mission objectives, and results. There is also a fact sheet on lunar EVAs including flight number, EVA date(s), astronauts, activities, and time spent in EVA. Image files include computer-generated images of current human mission concepts to the Moon and Mars, Apollo images, Viking images, and a few miscellaneous images of related artwork. Most images include a short description and the NASA image number. The Apollo Experiments Catalog (NASA RP-1317) is also available for on-line reference.

The Planetary Materials home page is dedicated to providing information related to the curation of extraterrestrial materials for scientific analysis. The Curator's home page may be accessed directly by opening the URL **http://www-sn.jsc.nasa.gov/curator/curator.htm**. Available information includes facts about the purpose of curation, personal contacts, on-line access to the curatorial databases, and information on each of the four planetary sample types managed by the Curator - lunar samples,

continued on page 5

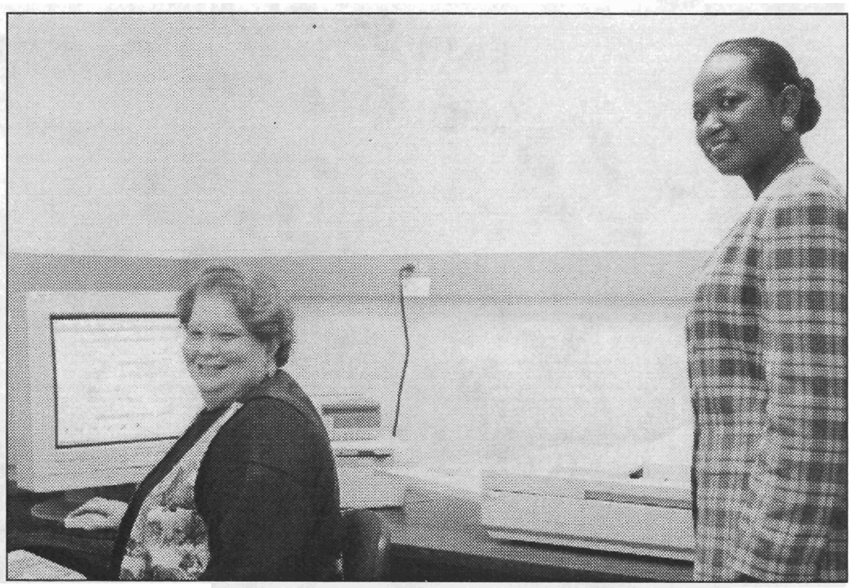
First Steps Toward Lunar Sample History on "Multimedia"

by Claire Dardano* and Jim Gooding**
*Lockheed Engineering & Sciences Company
**NASA/JSC

Chances are, it is on your desktop or in your home already: Multimedia Personal Computing (MPC). It is the ability to freely mix text and images (and sometimes sound) in a common video display that permits rapid access to enormous volumes of information. Twenty-five (going on 26) years worth of lunar sample processing records represent another example of information enormity with deeply embedded, unique scientific and historical meaning. And now lunar samples have met MPC.

Since the times of the *Apollo* landing missions in 1969-72, each of the original 2196 samples returned from the Moon has been bookkept with a "data pack," which represents the complete collection of paper records for that sample, including work orders, processing notes, and photographs. Over time, as samples were subdivided for research, the number of subsamples continuously grew (to more than 97,000 as of December 1994) as did the volume of associated paper data packs.

In 1994, we began to convert our treasure of data packs into electronic records through optical scanning and storage. Our motivation was not to be trendy but to securely preserve irreplaceable documents, including aging Polaroid photographs that show critical subdivisions of samples. Although we previously used



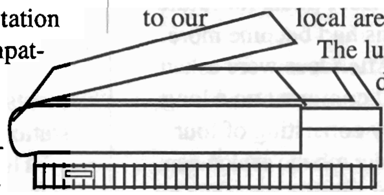
Linda Watts and Andrea Mosie work at the document imaging workstation.

microfilm and microfiche techniques to backup the paper records, the new MPC system will be faster, more economical, and of much higher fidelity with respect to photographs. Because the records will now be digital, they will be safely accessible to all future computer systems.

The hardware components of the document imaging workstation consist of a 486/66 IBM-compatible personal computer with a 1.8 gigabyte hard drive, a 21-inch high-resolution monitor, a flat-bed scanner, and a 1.3 gigabyte rewritable optical drive. The software for the system is FileMagic, a Windows-based document and image management application which controls the scanning, storage, and retrieval of documents. These documents may be scanned images or they may be electronic files stored in their native format, such as Microsoft Word. A document-oriented database is used for tracking the locations of the document files and for describing them with terms deemed appropriate for subsequent retrieval. The format and amount of information recorded may be defined by the users.

For the data pack project, sheets from the data packs are organized into "documents" and then scanned, indexed, and stored using the FileMagic application. Photos are stored as gray scale images with 256 shades of gray and forms are stored as black and white line art images. Gray scale and line art images may be mixed in asingle document, so that photos and forms for a single processing operation may be stored together as a single entity.

Currently the document imaging workstation is operated as a stand-alone system. The images are stored on removable optical drive cartridges and the FileMagic application and database are stored on the computer's hard drive. Future plans include the migration of the system to a file server with the database and application residing on the server and the optical disks residing on a juke box attached to it. With this configuration, the data pack information may be accessed by any Windows-based PCattached to our local area network.



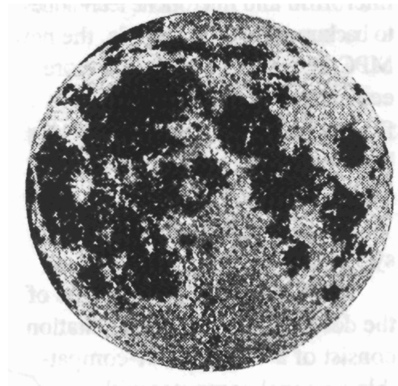
The lunar sample data pack scanning project began on Aug. 22, 1994. As of Jan. 1, 1995, 581 of the 757 Apollo 17 data packs have been scanned and indexed. Because the size of the data packs varies greatly depending on the original mass of the sample and the number of times that it has been subdivided, a "complexity index", calculated by multiplying the number of splits by the number of parents for each generic sample, is used for tracking progress. The 581 data packs which have been scanned represent 54% of the Apollo 17 collection and about 10% of the total lunar sample collection. Based on the progress thus far, the estimated time for completing the project is between 3 and 4 years. But the reward will be knowledge that the lunar sample records are secure for the future in electronic formats that will be accessible to a wide community of users.

What's next? Along with our team mates in the sample-processing laboratories, we are eager to conduct pilot projects on automated weighing and digital photography of samples. Again, the aim is to handle large volumes of information as efficiently as possible (with as little new paper as possible) while keeping them secure for future generations of users. ❑

New WWW Site
continued from page 4
Antarctic meteorite samples, stratospheric dust particles, and space exposed surfaces. Sample information includes descriptions of the collections, instructions for requesting samples, and articles from recent newsletters. The space exposed surfaces area also includes LDEF meteoroid and debris data. ❑

International Interest in Space Exploration

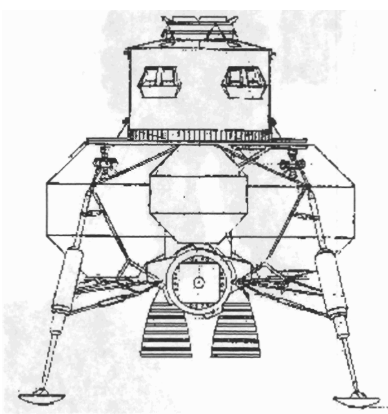
by Wendell Mendell
NASA/JSC



At the annual AIAA meeting in Washington, DC, in May, 1994, the Director-General of NASDA (Japan) and the Director of Strategic Planning for ESA (Europe) independently pointed to the Moon as the natural target for exploration in the next Century. However, each emphasized that the international space station had to be operational before either agency could turn its attention and resources to lunar exploration. Nevertheless, planning for lunar initiatives is beginning in both places.

At the 1992 World Space Congress, a 3-day COSPAR symposium on Astronomy and Space Science from the Moon included extensive contributions from Europe. At the symposium, the European Space Agency distributed the publication Mission to the Moon (esa sp 1150), which provides an excellent review and critique of possible observational experiments in the lunar environment.

By the time an international workshop was held in the late spring of 1994 in Beatenberg, Switzerland, ESA plans for future lunar missions had become more structured. Attendees were asked to review and comment on a long-range strategy consisting of four stages: (1) lunar robotic exploration; (2) permanent robotic presence on the surface; (3) initial exploitation of lunar resources; and (4) a lunar human outpost. The authors of the lunar strategy document deliberately refused to specify timelines or budgets for the phases. The first phase is to begin in the near term, will consist initially of lunar orbiters and landers, and will fit into the programmatic envelopes of current ESA scientific activities. The transition to the next phase will occur whenever the capabilities of the enabling technologies match the resources available to carry out the missions.



The workshop issued a statement, now called the Beatenberg Declaration (see *Lunar News* No. 57), supporting the proposed program in general. However, the precise wording of the statement reflects a compromise between the lunar advocates, who see a human presence on the Moon within the strategic horizon, and the traditionalists of the ESA scientific community, who view human space activities as inappropriate in the context of scientific objectives. The program reviewed at the Beatenberg conference will be presented to a meeting of the European ministers. If adopted, the European space program will take a decided turn toward the Moon following satisfaction of commitments to the international space station.

The prospects for lunar programs in Japan have evolved rapidly in the past year. In July, 1994, a Special Committee on Long-Term Vision, chartered by the Space Activities Commission, issued a report entitled Toward Creation of Space Age in the New Century. The report covers a planning horizon into the third decade of the 21st Century and covers all aspects of Japan's investment in space. The report foresees an international lunar base in the third decade and international lunar surface observatories somewhat earlier. Although sections of the report are slightly inconsistent (perhaps through translation difficulties), the plan identifies preliminary lunar missions in the first decade of the next century as part of a comprehensive, long term strategy of lunar exploration and development.

On September 7, 1994, a joint ISAS-NASDA conference was held to discuss plans for lunar exploration prepared by the Japanese Lunar and Planetary Society. Approximately 1000 attendees were addressed by both space professionals and representatives of Japanese society outside the aerospace community. The tone of the meeting was very upbeat and enthusiastic.

In summary, movement toward future lunar programs is proceeding

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Unique Glass Particles
from 68001 Lunar Core Thin Sections

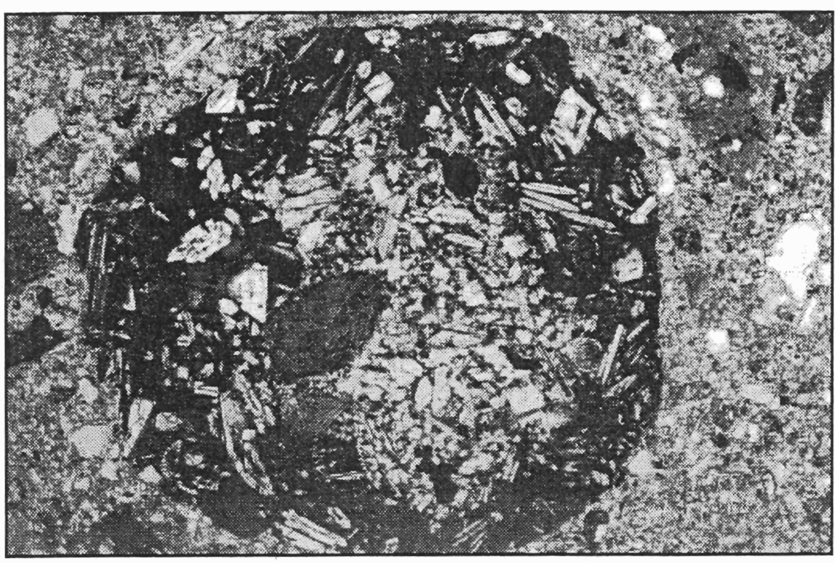
by James Holder* and Graham Ryder**
*Lockheed Engineering & Sciences Company
**Lunar and Planetary Institute

During the production of petrographic thin sections from lunar core 68001 (the bottom half of double drive tube 68002/68001) several unique glass particles were observed.

The largest, most representative sample, is approximately 2 mm x 2 mm and can be seen in both the second layer thin section ,6039, and again in the third layer thin section ,6040. This chondrule-like particle appears to consist mainly of small olivine crystals that are 50-200 micrometers long, many subhedral or hollow, set in a groundmass that varies from clear pale yellow glass in the center to devitrified to crystalline brown material around the outside. It has some blobs of rapidly quenched melts enclosed in it that texturally resemble barred chondrules. The spherical arrangement of the groundmass glass indicates this is a complete particle that formed as an impact splash glass and has not been broken . This particle is located 48.4 cm from the lunar surface.

Another 1 mm particle occurs in ,6044, a first layer then section 54.8 cm from the surface. A smaller, 0.5 mm inclusion, was observed in the second layer thin section ,6051, and is 59.6 cm from the surface.

Investigators who would like to study these chondrule like particles should request the thin sections per page 12-14. ❑



One of four (4) unique glassy particles observed in 68001 lunar core thin sections.

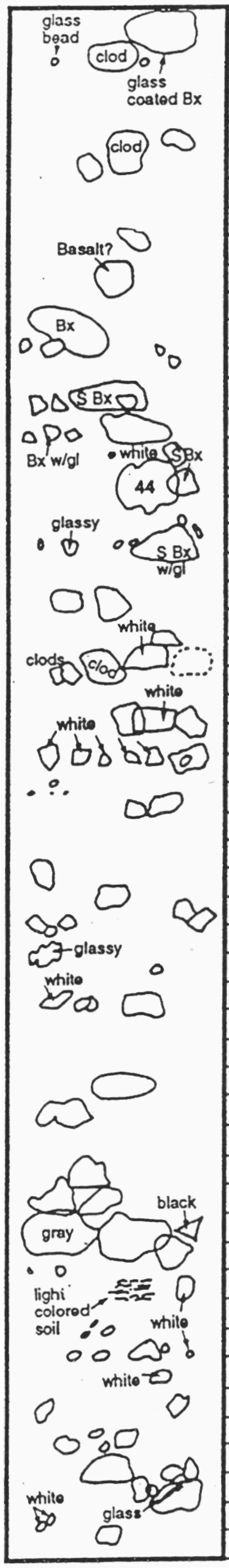
Lunar Core 68002
Diagrams

Diagrams for the three dissection passes of lunar core 68002 (top half of double drive tube 68002/1) completed in 1993 follow on pages 8-10. The diagram for the first pass was published in Lunar News No. 55 and the other two are previously unpublished. Diagrams for 68001 were published in Lunar New No. 57. All requests for material and thin sections should be made following the normal procedure used for lunar sample requests (pages 12-14). ❑

Space Exploration
continued from page 6

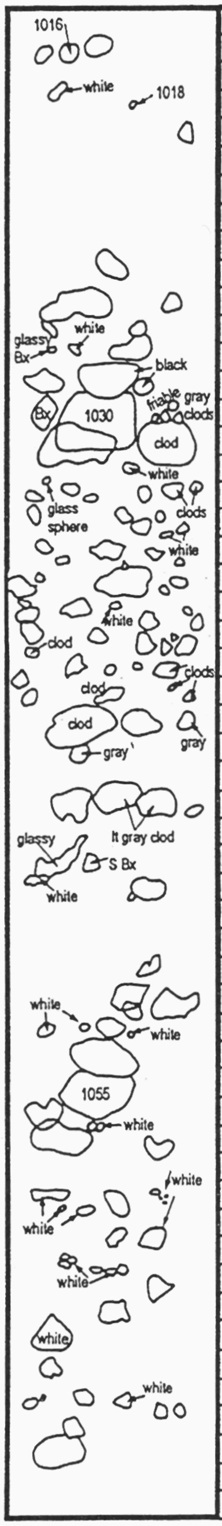
in Europe and in Japan. These strategies are being developed independently in the context of domestic space programs. The European initiative welcomes collaboration, but the authors are quite explicit in private about excluding the U.S. from any critical path of the initiative due to past experience with the unreliability of U.S. commitments. Published Japanese reports stress international cooperation for larger scale activities but explicitly state that international participation is not a necessary condition. These attitudes are real changes from the past. No future NASA lunar program can be formulated under the assumption that "international partners" will sign up to pay for parts of it. Also, NASA can no longer assume that space exploration will wait until the U.S. sets the agenda. ❑

DRIVE TUBE 68002 (First Pass)



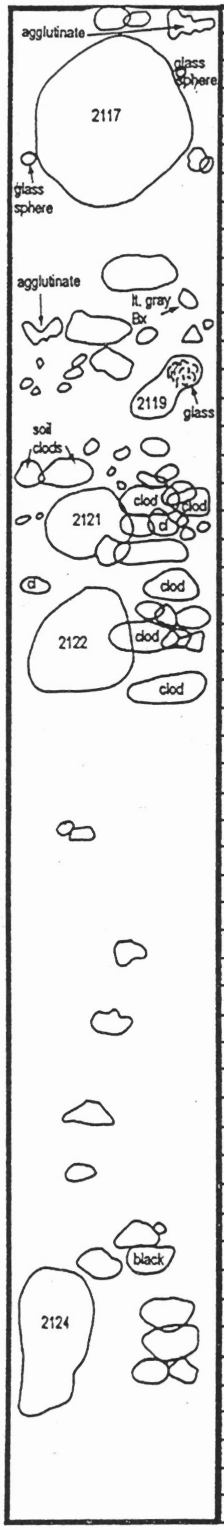
Depth (cm)	<1 mm Fraction Sample		>1 mm Fraction Sample		Special Samples		
	No.	Wt.	No.	Wt.	No.	Wt.	Type
0.5	10	.771	11	.150			
1.0	12	.545	13	.024			
1.5	14	.675	15	.018			
2.0	16	.806	17	.061			
2.5	18	.773	19	.055			
3.0	20	.967	21	.110			
3.5	22	1.051	23	.096			
4.0	24	.995	25	.081			
4.5	26	1.492	27	.108			
5.0	28	1.354	29	.154			
5.5	30	1.777	31	.126			
6.0	32	1.603	33	.583			
6.5	34	1.507	35	.192			
7.0	36	1.327	37	.521			
7.5	38	1.424	39	.805			
8.0	40	1.133	41	.172	44	1.395	cp w/metal?
8.5	42	1.411	43	.227			
9.0	45	1.712	46	.144			
9.5	47	1.540	48	.343			
10.0	49	1.671	50	.193			
10.5	51	1.843	52	.193			
11.0	53	1.473	54	.113			
11.5	55	1.690	56	.532			
12.0	57	1.932	58	.399			
12.5	59	1.803	60	.456			
13.0	61	1.930	62	.350			
13.5	63	2.085	64	.175			
14.0	65	1.686	66	.288			
14.5	67	1.944	68	.165			
15.0	69	2.216	70	.278			
15.5	71	1.967	72	.183			
16.0	73	2.178	74	.263			
16.5	75	1.878	76	.190			
17.0	77	1.874	78	.126			
17.5	79	1.902	80	.219			
18.0	81	2.051	82	.121			
18.5	83	1.831	84	.124			
19.0	85	2.042	86	.295			
19.5	87	2.218	88	.229			
20.0	89	2.130	90	.197			
20.5	91	1.990	92	.174			
21.0	93	1.832	94	.225			
21.5	95	1.997	96	.694			
22.0	97	1.723	98	.168			
22.5	99	2.116	100	.449			
23.0	101	2.243	102	.119			
23.5	103	2.041	104	.247			
24.0	105	2.130	106	.172			
24.5	107	1.512	108	.184			
25.0	109	2.030	110	.394			
25.5	111	1.960	112	.295			
26.0	113	1.893	114	.320			
26.5	115	2.047	116	.255			
26.7	117	1.136	118	.099			

DRIVE TUBE 68002 (Second Dissection)



Depth (cm)	Unsieved Sample No.	Unsieved Sample Wt.	Special Samples No.	Special Samples Wt.	Special Samples Type
0.5	1013	1.208			
1.0	1014	2.203	1016	.056	black glass sphere
1.5	1015	2.669			
2.0	1017	2.175	1018	.007	glass sphere
2.5	1019	2.610			
3.0	1020	2.450			
3.5	1021	2.796			
4.0	1022	2.423			
4.5	1023	3.158			
5.0	1024	2.780			
5.5	1025	2.608			
6.0	1026	2.879			
6.5	1027	2.926			
7.0	1028	3.480			
7.5	1029	3.436	1030	.396	dusty gray basalt?
8.0	1031	2.538			
8.5	1032	2.41			
9.0	1033	3.415			
9.5	1034	3.499			
10.0	1035	3.371			
10.5	1036	3.642			
11.0	1037	3.674			
11.5	1038	2.792			
12.0	1039	3.287			
12.5	1040	3.297			
13.0	1041	2.969			
13.5	1042	2.806			
14.0	1043	3.248			
14.5	1044	3.345			
15.0	1045	2.821			
15.5	1046	3.892			
16.0	1047	3.391			
16.5	1048	2.866			
17.0	1049	3.274			
17.5	1050	3.483			
18.0	1051	3.653			
18.5	1052	3.377			
19.0	1053	2.320			
19.5	1054	3.094	1055	.382	dusty gray Bx?
20.0	1056	2.949			
20.5	1057	2.695	1058	.379	anorthosite?
21.0	1059	3.864			
21.5	1060	3.250			
22.0	1061	3.065			
22.5	1062	3.141			
23.0	1063	3.159			
23.5	1064	3.648			
24.0	1065	3.063			
24.5	1066	3.422			
25.0	1067	3.274			
25.5	1068	2.817			
26.0	1069	3.197			
26.5	1070	2.524	1072	.834	
26.7	1071	1.314			

DRIVE TUBE 68002 (Third Dissection)



Depth (cm)	<1 mm Fraction Sample		>1 mm Fraction Sample		Special Samples		
	No.	Wt.	No.	Wt.	No.	Wt.	Type
0.5	2006	2.124	2007	.314			
1.0	2008	2.726	2009	.115			
1.5	2010	1.920	2011	.170			
2.0	2012	1.384	2013	.084	2117	14.324	anorthosite
2.5	2014	1.458	2015	.117			
3.0	2016	1.692	2017	.298			
3.5	2018	2.434	2019	.171			
4.0	2020	2.570	2021	.177			
4.5	2022	2.162	2023	.184			
5.0	2024	2.175	2025	.478			
5.5	2026	2.575	2027	.245			
6.0	2028	2.332	2029	.539			
6.5	2030	2.200	2031	.337			
7.0	2032	2.025	2033	.246	2119	.501	soil Breccia w/glass
7.5	2034	1.590	2035	.350			
8.0	2037	2.295	2038	.305	2036	.512	red light sample
8.5	2039	2.221	2040	.509			
9.0	2041	1.795	2042	1.013			
9.5	2043	1.639	2044	.769	2121	1.576	friable soil clods
10.0	2045	1.744	2046	.757			
10.5	2047	1.630	2048	.821			
11.0	2049	1.752	2050	.582			
11.5	2051	1.431	2052	.819	2122	3.349	dusty soil Bx?
12.0	2053	1.531	2054	.387			
12.5	2055	2.437	2056	.634			
13.0	2057	2.573	2058	.234			
13.5	2059	2.590	2060	.300			
14.0	2061	3.247	2062	.181			
14.5	2063	2.550	2064	.151			
15.0	2065	2.631	2066	.244			
15.5	2067	2.973	2068	.187			
16.0	2069	2.635	2070	.264			
16.5	2072	2.515	2073	.111	2071	.624	red light sample
17.0	2074	2.704	2075	.191			
17.5	2076	2.715	2077	.173			
18.0	2078	2.501	2079	.417			
18.5	2080	2.642	2081	.406			
19.0	2082	2.236	2083	.198			
19.5	2084	3.469	2085	.224			
20.0	2086	2.646	2087	.422			
20.5	2088	2.533	2089	.180			
21.0	2090	2.319	2091	.292			
21.5	2092	3.262	2093	.202			
22.0	2094	2.598	2095	.284			
22.5	2096	2.822	2097	.294			
23.0	2098	2.884	2.099	.235			
23.5	2100	2.520	2101	.286	2124	2.697	black, fine-grained
24.0	2102	2.271	2103	.613			
24.5	2104	2.486	2105	.411			
25.0	2106	2.282	2107	.184			
25.5	2109	2.975	2110	.218	2108	.981	red light sample
26.0	2111	2.610	2112	.135			
26.5	2113	1.695	2114	.109			
26.7	2115	1.225	2116	.148			

Apollo 17 Rock Catalog is Complete!

We are pleased to report that Catalog of Apollo 17 Rocks, Volume 4—North Massif, by Charles Meyer (August 1994), was released by the Government Printing Office and is available for distribution. Volume 4 includes a comprehensive index that will help the reader locate, by generic sample number, the description of any Apollo 17 rock contained in any of the four volumes.

Copies of each volume of the four-volume catalog have been sent to all persons who made requests previously. But if you would like to complete your lunar catalog library now, please select from the menu given below:

Volume	Author(s)	Rocks Described	Publication Date
1	Graham Ryder	72215-73285 (South Massif)	February 1993
2	Clive Neal and Larry Taylor	70017-71597 (Central Valley, Part 1)	February 1993
3	Clive Neal and Larry Taylor	72135-155; 74115-75115; 79035-537 (Central Valley, Part 2)	March 1994
4	Chuck Meyer	76015-78599 (North Massif)	August 1994

Please send me one copy of each of the following volumes from the Apollo 17 rock catalog.

Vol. 1 ____ Vol.2 ____ Vol.3 ____ Vol.4 ____

Send to: Name: ____________________
Address: ____________________
____
City: ____________ State: ________
Zip Code: ____________ Country: ________

Please return this catalog request to:

Lunar Sample Curator
SN2/Office of the Curator
NASA/Johnson Space Center
Houston, TX 77058-3696 USA

Fax: (713) 483-2911

To request a catalog, please return the form listed above or notify us be e-mail at the address given on page 2. You can also notify the author of volume 4, Chuck Meyer, and extend your appreciation for his efforts in completing this series. Chuck did a commendable job in getting an important piece of scientific literature out into our community of lunar sample researchers.

Revised: January 1995

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 Johnson Space Center (JSC). Any and all individuals requesting lunar samples 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 any one of three ways: (1) A formal research proposal recommended by the Lunar and Planetary Geosciences Review Panel (LPGRP) within the past three years; (2) A formal research proposal recommended by the Indigenous Space Resources Utilization (ISRU) panel for work pertaining to the specific sample request (step B); (3) Submittal of reprints of scientific articles pertaining directly to the specific research methods to be applied to the samples (step B), and published in peer-reviewed professional journals.

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. James L. Gooding
Lunar Sample Curator
SN2
NASA Johnson Space Center
Houston, TX 77058-3696
USA
Fax: (713) 483-2911

For engineering and resource-utilization studies, the sample request should be submitted to the Lunar Simulant Curator at the following address:

Dr. Douglas W. Ming
Lunar Simulant Curator
SN4
NASA Johnson Space Center
Houston, TX 77058-3696
USA
Fax: (713) 483-5347

The Lunar Simulant Curator will arrange for an ISRU review of the applications-oriented sample request to assure that all necessary demonstration tests with simulated lunar materials have been satisfactorily completed. Requests determined to be sufficiently mature to warrant consideration for use of lunar materials will then be forwarded to the Lunar Sample Curator.

For all 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.

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 simple 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 Lunar Sample 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 should apply in writing to the following address:

Mr. Boyd E. Mounce
Lunar Sample Specialist
AP4/Public Services Branch
NASA Johnson Space Center
Houston, TX 77058-3696
Fax: (713) 483-4876

Mr. Mounce 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. Mounce 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:

Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming

NASA Teacher Resource Center
Mail Stop T12-A
NASA Ames Research Center
Moffett Field, CA 94035-1000
PHONE: (415) 604-3574

Connecticut, Delaware, New York, Pennsylvania, Rhode Island, Vermont, District of Columbia, New Hampshire, New Jersey, Maine, Maryland, Massachusetts

NASA Teacher Resource Laboratory
Mail Code 130.3
NASA Goddard Space Flight Center
Greenbelt, MD 20771-0001
PHONE: (301) 286-8570

Colorado, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas

NASA Teacher Resource Room
Mail Code AP-4
NASA Johnson Space Center
Houston, TX 77058-3696
PHONE: (713) 483-8696

Florida, Georgia, Puerto Rico, Virgin Islands

NASA Educators Resource Laboratory
Mail Code ERL
NASA Kennedy Space Center
Kennedy Space Center, FL 32899-0001
PHONE: (407) 867-4090

Kentucky
North Carolina
South Carolina
Virginia
West Virginia

NASA Teacher Resource Center
for Langley Research Center
Virginia Air and Space Center
600 Settler's Landing Road
Hampton, VA 23669-4033
PHONE: (804) 727-0900 x757

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

NASA Teacher Resource Center
Mail Stop 8-1
NASA Lewis Research Center
21000 Brookpark Road
Cleveland, OH 44135-3191
PHONE: (216) 433-2017

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

NASA Teacher Resource Center
for Marshall Space Flight Center
U.S. Space and Rocket Center
P.O. Box 070015
Huntsville, AL 35807-7015
PHONE: (205) 544-5812

Mississippi

NASA Teacher Resource Center
Building 1200
NASA John C. Stennis Space Center
Stennis Space Center, MS
39529-6000
PHONE: (601) 688-3338

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:

Lunar Sample Curator
SN2
NASA Johnson Space Center
Houston, TX 77058-3696
Fax: (713) 483-2911

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.