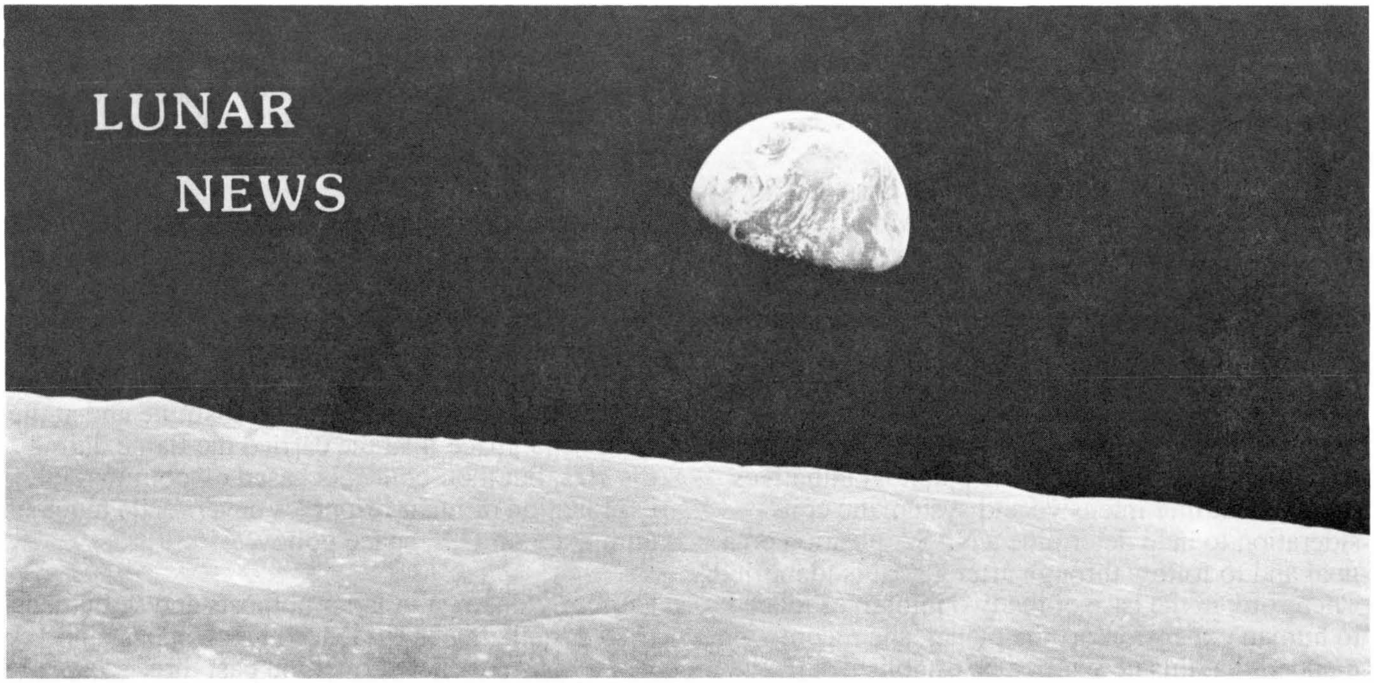


NASA ESTABLISHES OFFICE OF EXPLORATION

(Editor's Note: The following is a NASA press release dated June 1, 1987.)

Dr. James C. Fletcher, administrator of NASA, announced today the creation of an Office of Exploration to coordinate agency activities that would "expand the human presence beyond Earth," particularly to the Moon and Mars.

He said that Dr. Sally K. Ride would serve as its acting assistant administrator until mid-August. She is scheduled to leave NASA in early autumn to assume a position at Stanford University. Dr. Ride has been in charge of a NASA study to determine a possible new major space goal for the United States.

"There are considerable - even urgent - demands for a major initiative that would re-energize America's space program and stimulate development of new technology to help the nation remain pre-eminent both in space and in the world's high-tech market place," Dr. Fletcher said.

"This office is a step in responding to that demand," Dr. Fletcher said. "It will analyze and define missions proposed to achieve the goal of human expansion off the planet. It will provide central coordination of technical planning studies that will involve the entire agency. In particular, it will focus on studies of potential lunar and Mars initiatives."

Dr. Fletcher noted that Dr. Ride's study group recently identified four major areas for concentrated examination as possible initiatives in pursuit of a new national space objective. These are:

- Intensive study of Earth systems with the goal of exponentially expanding knowledge required to protect the environment.

LUNAR NEWS NO. 49 SUMMER 1987

CONTENTS:

- A substantially stepped-up robotic program to explore the planets, moons, and other bodies in the solar system.

- Establishment of a scientific base and a permanent human presence on the Moon.

- Human exploration of Mars preceded by intensive robotic exploration of the planet.

Dr. Fletcher said the Ride study group developed these possible goals in a "workshop/task force environment." He said that at that plateau "Sally concluded that these and other potential initiatives deserved further intensive and systematic consideration to help determine a NASA position on a goal and to follow through after a goal is identified. Therefore, in the case of the two initiatives related to human expansion off the planet, she recommended that this new office be established."

Further studies of the Earth systems and robotic solar system proposals will be managed by the Office of Space Science and Applications where these interests have been well established for years.

"Planning for the civil space program that NASA recommends may well include a combination of the areas under consideration," Dr. Fletcher said.

The new office will concentrate on mission concepts and scenarios, schedules, transportation requirements, facilities, utilization, resources requirements, and science opportunities.

Dr. Fletcher said that a decision to go to the Moon or Mars would not impact the first phase of Space Station development. Current plans are to build the Station in two phases. A lunar or Mars initiative would influence the design of the second phase so it could serve as a technology test bed and a logistics terminal for lunar or Mars activities.

****
****

BOOK REVIEW

Wendell Mendell
NASA Johnson Space Center

Lunar Entrepreneurs Directory, Edited by Steve Durst. 12 pages. Space Age Publishing Company, 3210 Scott Boulevard, Santa Clara, CA. $50/first copy; $25/first copy for Space Calendar subscribers; free first copy for Space Daily subscribers; reduced rates for multiple copies.

Lunar base planning was an official NASA activity during the Apollo program and served as a base of information for the Space Task Group Report to the President in 1970. However, with the demise of Project Apollo in 1972, advanced lunar studies vanished from the NASA "gray literature." A few hardy souls at the Space Studies Institute and at the California Space Institute carried the flame during the 70's, but their concepts based on commercial exploitation of lunar resources never made much of an impact on U.S. space policy.

Currently, interest in lunar outposts and settlements is recrystallizing as evidenced by symposia and workshops conducted over the past three years. Most of the activity has been organized or loosely coordinated by an ad hoc group under the name "The Lunar Initiative." The strategies now in vogue are based on an evolutionary view of NASA's proposed Space Transportation System. Until very recently, no formal planning organization within NASA was addressing these topics; and much of the momentum and support for the ideas have come from outside NASA.

The people at Space Age Publishing are great believers in the economic potential of space development and have been very supportive of the various activities associated with the Lunar Initiative. They have recognized the difficulty inherent in maintaining a flow of information within a small, widely dispersed, and highly diverse community of interest which has no formal organization. Therefore, their Lunar Entrepreneurs Directory "is designed to serve as a communications vehicle for the acceleration of activities leading to an early and permanent Return to the Moon by Americans and other individuals."

The directory lists approximately 400 individuals, organizations, and companies that have been associated with lunar development and exploration in its broadest definition. Many were attendees at either the October 1984 Lunar Base Symposium in Washington, DC, or the August 1985 Lunar Development Symposium in Atlantic City, NJ. The major organizations that characterize themselves as promoting lunar development are described briefly. A few of the listings for individuals are annotated with a short statement of expertise or interest. Most citations include addresses and phone numbers.

The compilation, in my opinion, is about as good as one could expect, given the information in the public domain. The directory does indeed include all the lunar entrepreneurs of which I am aware. On the other hand, most of the people listed probably would not characterize themselves as such. In fact, I suspect a few will be surprised to find their names here. I estimate that approximately five percent of the listings for individuals are out of date.

Although the directory has a number of flaws, it is a unique document. It will be most useful to lunar development enthusiasts who cannot attend specialized symposia regularly and who must follow events through the news media or scientific publications. The author of an article or a person mentioned in a news item can be contacted for more information using the address in the directory. Often the context of an announcement can be understood if the professional affiliation or background of the source is known. Unfortunately, the price is rather high for individuals who might benefit most from it, i.e., those somewhat isolated from the centers of space technology development. I do not fault the publishers because costs can be quite high for low-volume documents. Hopefully, as the level of activity in lunar research grows, the Lunar Entrepreneurs Directory will become the roster of a well-defined professional community.

****
****

WORKSHOP ON LUNAR SOILS FOR PLANT GROWTH

Donald L. Henninger
NASA Johnson Space Center

A workshop entitled "Lunar Derived 'Soils' for the Growth of Higher Plants" was held at NASA Johnson Space Center on June 1 and 2, 1987. The workshop was convened to tap the agricultural and related sciences community on how lunar regolith might be used as a solid plant substrate at a lunar base. The production of food plants is a major component of a Controlled Ecological Life Support System (CELSS), and use of the lunar soil, much as terrestrial soils are used, has some potential advantages, such as a high buffering capacity and source of plant growth nutrients. It is possible that a lunar base agricultural facility could not only provide food to lunar base crews but might also supply food to space stations and piloted interplanetary spacecraft as well as accepting waste materials from other space activities.

Over 70 scientists representing more than 15 universities, five other federal agencies, and eight industries participated in the day-and-a-half workshop. Since a large proportion of the participants have not been involved in lunar analyses, background briefings on the lunar regolith and lunar environment were provided by Jeff Taylor, University of New Mexico, and Dave McKay of NASA Johnson Space Center. Similarly, background briefings on NASA's Controlled Ecological Life Support Systems (CELSS) research program were given by John Langmead of NASA Headquarters, Ralph Prince of NASA Kennedy Space Center, Joe Gale representing NASA Ames Research Center, and Don Henninger of NASA Johnson Space Center. Briefings on NASA's lunar base scenarios, Mars base scenarios, and the Mars Rover and Sample Return Mission were provided by Barney Roberts, Kyle Fairchild, and Doug Blanchard, respectively, all of NASA Johnson Space Center.

"Lunar News" is produced three times a year by the Planetary Materials Branch of the Solar System Exploration Division, Johnson Space Center of the National Aeronautics and Space Administration. "Lunar News" is intended to be a forum for discussion of facts and opinions regarding lunar sample study, Lunar Geochemical Orbiter and Lunar Base activities. It is sent free to a mailing list of more than 700 individuals; to be included on the mailing list, write to the address below. Your contributions to "Lunar News" on topics relating to the study, exploration and utilization of the Moon and comments about "Lunar News" and material appearing in it should be sent to:

Doug Blanchard, Lunar Sample Curator
Code SN2, NASA JSC
Houston, TX 77058

After the background briefings, workshop participants were divided into two working groups. One group chaired by Lloyd Hossner of Texas A&M University addressed the chemical and physical properties of a lunar derived soil while another group chaired by Frank Salisbury of Utah State University addressed the biological properties. Within each group, invited presentations were given to serve as point of departure for the group discussions.

The groups prepared a list of prioritized research topics and suggested approaches. A common thread surfaced in both groups of scientists and that was a need for simulated lunar regolith in reasonably large quantities to support this line of research. Complete results of the workshop will be published by the end of the year.

****
****

NEW SAMPLES FROM LUNA 16, 20, AND 24

Jeff Taylor
University of New Mexico

During the 18th Lunar and Planetary Science Conference, Dr. V. L. Barsukov of the U.S.S.R. Academy of Science and the Vernadsky Institute presented two grams of lunar material collected by unmanned Luna missions to Dr. G. Jeffrey Taylor, LAPST Chairman. This allocation by Soviet scientists to the U.S. lunar scientific community represents another example of scientific collaboration in lunar and planetary science between Soviet and American scientists. LAPST has arranged for the samples to be processed in the Curatorial Facility at the Johnson Space Center.

The samples and masses received are listed in Table 1. Ms. Kim Willis of LEMSCO hand-picked all fragments larger than about 0.5 mm. These fragments were then rinsed in freon and placed into lithologic categories by LAPST members Jeff Taylor, Paul Spudis, and Graham Ryder. Descriptions of these subsamples appear below.

LAPST will consider requests for these at a special meeting in mid-August 1987. LAPST will also consider requests for the < 0.5 mm fines (the ",0" samples described below) and, if needed, can arrange to have them sieved into two size categories, 250-500 microns and < 250 microns. More extensive sieving cannot be accommodated. Requests must be received by August 6, 1987, to be considered. Please include a discussion of the scientific justification for the specific samples requested.

Luna 16:

21036,0 - Bulk fines from which particles > ~ 0.5 mm have been removed. Dark gray in color.

21036,1 - Regolith breccias. There are 51 fragments ranging in size from 0.5 to 2.5 mm. They are fine-grained microbreccias; some contain white clasts. Some are very friable, others coherent. A few are coated partially by glass.

21036,2 - Coarser-grained crystalline rocks. This sample consists of 14 particles ranging in size from 0.5 to 1.5 mm. One fragment appears to be an olivine crystal. The remainder look like mare basalts. The average grain size in them is about 0.1 mm, and they contain roughly equal amounts of plagioclase and mafic minerals. Two fragments are partially coated by glass.

21036,3 - Fine-grained crystalline rock fragments. This sample contains six particles, 1.0 - 1.7 mm in size. They are fine-grained, gray fragments that could be fine-grained mare basalts.

21036,4 - Glassy particles. This group consists of 16 fragments ranging in size from 0.4 to 3 mm. Most are agglutinates or fragments of glass coatings. One fragment has a large cavity in it that appears to be coated with glass.

Luna 20:

22023,0 - Bulk fines from which particles > ~ 0.5 mm have been removed. Medium gray in color.

22023,1 - Agglutinates and regolith breccias. This group consists of 20 particles ranging in size from 0.4 to 1.2 mm. All are moderately coherent and light gray in color.

22023,2 - Feldspathic crystalline fragments. There are 20 particles in this group. They range in size from 0.5 to 1.0 mm. Many appear to be single crystals of plagioclase. Others are aggregates of plagioclase grains.

22023,3 - Fine-grained crystalline rock fragments. This consists of six dark-colored fragments ranging from 0.6 to 1.7 mm in size. They could be impact melt breccias. Two have white clasts (about 0.1 mm in size).

22023,4 - Coarser-grained crystalline rock fragments. This sample contains six particles that range in size from 0.8 to 1.5 mm. Most have granular textures with grain sizes of about 0.05 mm and are rich in feldspar. They are probably feldspathic, granulitic breccias.

Luna 24:

24088,0 - Bulk fines from which particles > ~ 0.5 mm have been removed. Medium gray color.

24088,1 - Regolith breccias, agglutinates, and others. This is a mixed bag containing 24 particles ranging in size from 0.3 mm to 2.6 mm. Soil breccias range greatly in coherency. Some are coated partially with dark glass. Four are fine-grained crystalline fragments that might be impact-melt breccias. One might be a shocked basalt.

24088, 2 - Coarse-grained basalt and mineral fragments. This group contains 18 particles, 0.5 to 1.7 mm in size. Five are dark amber-brown monomineralogic clinoryroxene grains that are clear and glassy-looking. One is a broken sphere (0.75 mm in diameter) with a pale brownish orange color. Three are white, feldspar-rich fragments containing interstitial dark material in an almost graphic texture. One fragment is multimineralogic, but a green mineral, perhaps olivine, is conspicuous. Finally, eight fragments are medium-to-coarse basalts that are low in opaque minerals; they consist of brown pyroxene and white, clean plagioclase.

24088,3 - Fine-grained basalts. This sample contains seven fragments, 0.9 to 1.6 mm in size. They consist of about half plagioclase and half mafic minerals, with less than a few percent ilmenite. Their grain size is smaller than 0.1 mm. The fragments are similar to nine particles in 24105,2, except for being finer grained.

24105,0 - Bulk fines from which > ~ 0.5 mm particles have been removed. Medium gray color.

24105,1 - Agglutinates, regolith breccias, and others. This is a group of 20 fragments ranging in size from 0.4 to 1.3 mm. Some are quite friable. Five of them might be fine-grained, crystalline fragments.

24105,2 - Coarse-grained crystalline rock and mineral fragments. This is a group of 17 particles ranging in size from 0.4 to 1.4 mm. Two fragments are plagioclase grains (one clear, one translucent), both about 0.5 mm long. Nine particles are yellow-brown basalt fragments with grain sizes of about 0.1 - 0.2 mm; opaques are scattered and pyroxene appears to be more abundant than plagioclase. Four fragments are plagioclase-rich and coarse-grained, probably from a coarse-grained basalt. Finally, two particles are black and white crystalline rock fragments that might represent a highland rock type, but also be nonrepresentative portions of a mare basalt; one has a grain size of 0.2 mm and could be granulitic, whereas the other has a grain size of 0.1 mm and a more basaltic texture.

24105,3 - Fine-grained basalt fragment. This is "Big Ivan," an equant, 3-mm fragment of mare basalt. It consists of 40% plagioclase and 60% mafics, with a trace of opaque minerals. Olivine occurs as phenocrysts set in a matrix of grains

Table 1. Luna samples received in March 1987 from the Soviet Union

Mission	Soviet Sample No.	U.S. Sample No.	Depth in Core (cm)	Weight (mg)
Luna 16	1636	21036	20 - 28	998
Luna 20	2023	22023	5 - 27	524
Luna 24	24088.1	24088	88	505
Luna 24	24105.1	24105	105	492

smaller than 0.1 mm. It is vesicular, with the vesicles ranging from 0.1 to 0.5 mm in size. One surface has a couple of zap pits.

24105,4 - Fine-grained crystalline rocks. This group contains three angular fragments 1 to 1.5 mm in size. They have grain sizes of less than 0.05 mm, have a yellowish brown color, and contain no mineral clasts.

****
****

CURATORS' COMMENTS

Doug Blanchard
John Dietrich
NASA Johnson Space Center

Lunar Sample Allocations

The Lunar and Planetary Sample Team (LAPST) reviewed 18 lunar sample requests from 16 investigators at its June 1-2 meeting and recommended allocating 170 samples (weighing 173.9 grams) and 137 thin sections to 14 investigators. Three generalized requests for Luna samples were tabled until a special LAPST meeting to be held in August. Preliminary descriptions of the new samples published in this issue of LUNAR NEWS will provide data needed for more detailed requests.

LAPST also reviewed and endorsed the Curator's allocation of one returned sample (weighing 3.85 grams) and 16 thin sections to four investigators who requested samples between the February and June meetings.

Continuing interest in newly opened cores 79001 and 79002 led to requests from two investigator teams. One requested samples of large breccia fragments for analysis of the nitrogen isotopes. The other requested samples distributed along these cores and four other double-drive-tube cores for several studies including measurements of ^{10}Be, ^{26}Al, ^{53}Mn, and/or ^{129}I.

Studies of breccia clasts generated requests from three investigators. One request for an Apollo 15 breccia supports a study in the Apennine Front project. The request for another Apollo 15 breccia supports an investigation of the origin of KREEP basalts. The third request continues an ongoing study of rocks represented as clasts in Apollo 14 breccias. LAPST recommended access to new slab surfaces, and allocation of samples from clasts identified during the study of those surfaces, for each of the three investigations. Rock sawing required to provide the new surfaces will be scheduled early this summer.

Two investigators are independently pursuing studies of Apollo 15 basalts. Each has identified a suite of samples for petrographic study and analysis for major and trace elements. Another group is studying mare basalts from the Apollo 16 highland site. A member of that team will examine coarse particles from an Apollo 16 core and select fragments for that study.

Other recommended allocations support studies of:

- Petrologic diversity of pristine lunar rocks,
- Chemistry of volcanic glasses,
- Crystallographic study of coexisting polymorphs,
- Reflectance spectra of lunar minerals,
- Xenon in lunar anorthosites, and
- Datable lunar zircons.

LAPST recommended denial of two requests received between the February and June 1987 meetings.

Cumulative Index for the Proceedings

The LPI is preparing an index for the first seventeen volumes of the Proceedings of the Lunar and Planetary Conferences. This new index volume will incorporate the index information that has been published in a separate volume for the first nine Proceedings volumes. This first index volume has been extremely useful although there are a few errors. If you have discovered any of these errors, you can provide a valuable service to the LPI and to the community by sending your corrections to:

Stephanie Tindell
LPI Publications Office
3303 NASA Road One
Houston, TX 77058

What Next in Curatorial Activities?

In response to requests from investigators, LAPST has recommended that the Curator saw two new slabs, one from 14303 and one from 15205. An existing slab of 15205 will be retrieved from a PI laboratory to check on its suitability for the study proposed.

LAPST has also recommended that the Curator continue with core dissection processing. The core recommended is 15009, a single drive-tube obtained at the Apennine front, station 6 of Apollo 15. This is the last of the Apollo 15 cores to be dissected. It is of particular interest to the investigators who are intensely studying the mare basalt suites at the Apollo 15 site.

Dissection of Lunar Core 79001/2

The dissection of lunar core 79001/2 has been completed in the pristine sample laboratory in the Planetary Materials Branch. The first half (lunar top) of the double drive tube, 79002, was totally dissected by the end of November 1986. The second half (lunar bottom), 79001, was completed in April 1987. Thin sections from 79002 are complete and available for allocation. Thin sections from 79001 will be complete by mid-summer 1987.

The dissection of 79001/2 is documented on the diagrams which follow. The estimated FeO contents and the ferromagnetic resonance (FMR) data, indicating the relative degree of surface exposure, are reported for both halves. Both sets of data are provided by Dick Morris, JSC. The 79002 data was reported in a previous LUNAR NEWS and is included here again for completeness. *(In the previous graph of the FMR data, the regions of maturity were mislabeled by the editor -- they are correct in this copy.)*

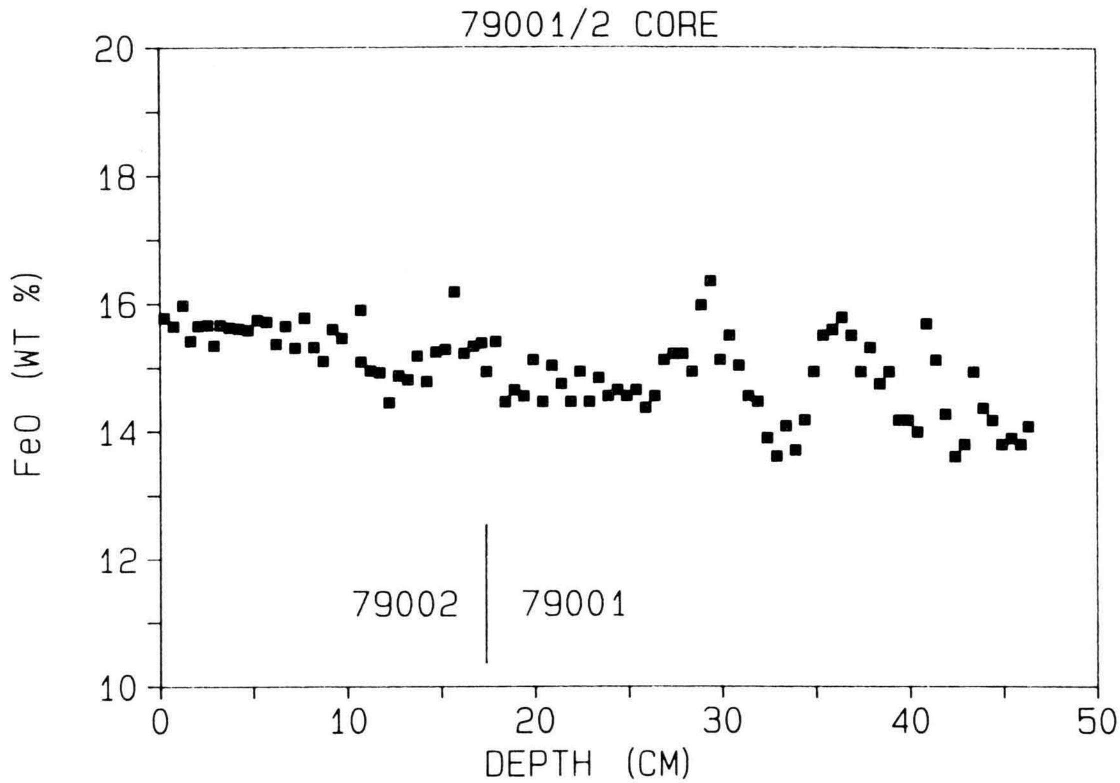
79001/2 was dissected in three separate 0.5 cm deep passes using dissection intervals of 0.5 cm. All splits are identified, including sieved (at 1 mm) and unsieved samples and large or special particles. The data for the 79002 core was reported in the last LUNAR NEWS. Only the data for 79001 is reported here.

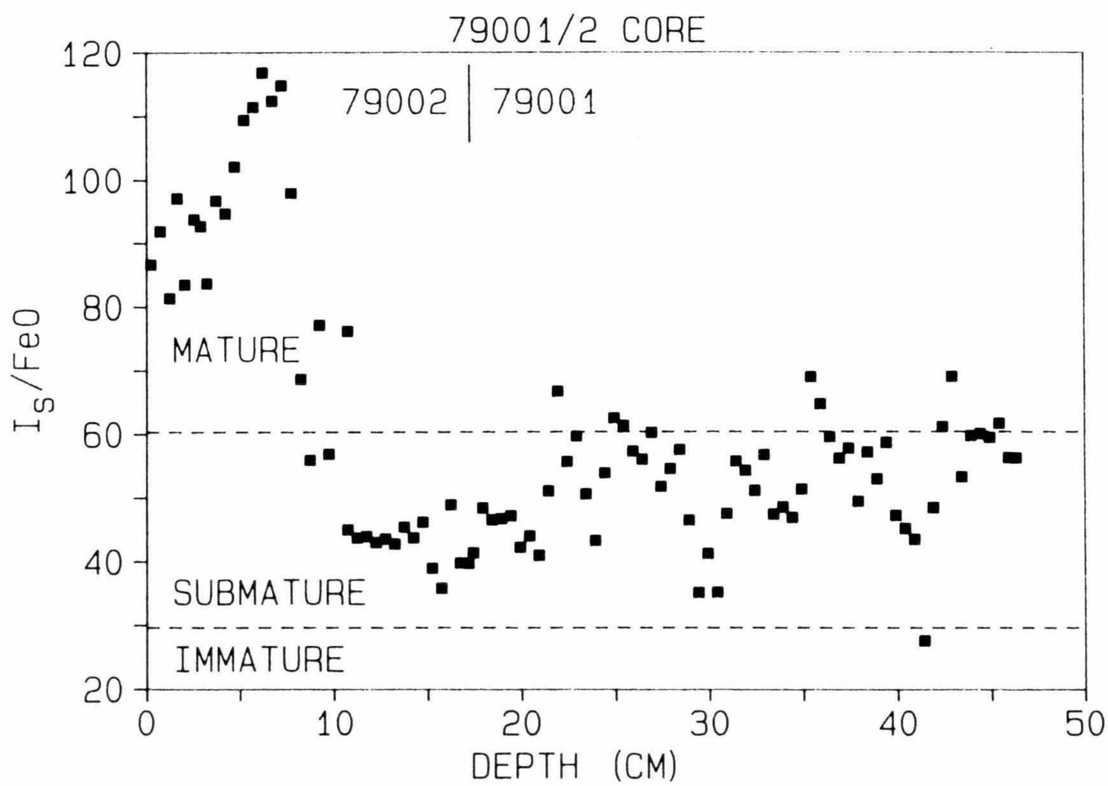
Carol Schwarz was the dissection processor for both halves of this core. The illustrations were prepared by Claudine Robb.

Final Notes

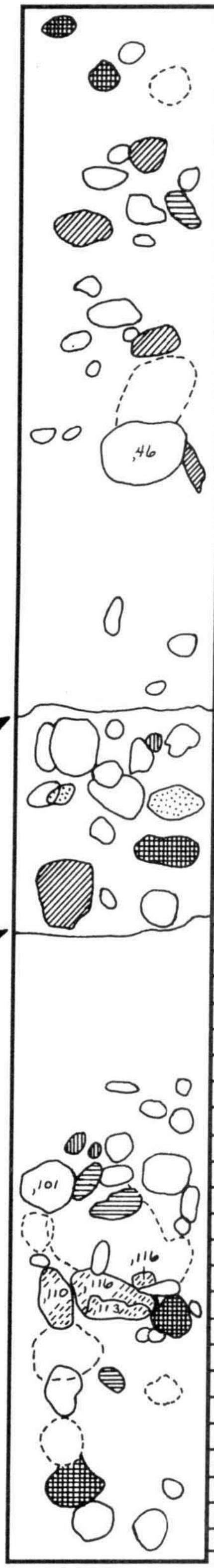
LAPST, at its last meeting, held a LAPST Logo Contest. After several entries, some of which were quite graphic, LAPST (in rare good taste) abandoned the contest for lack of good taste (actually lack of any taste at all). Late entries from the community at large may still be accepted by LAPST at their August meeting (or maybe not).

In spite of the fact that we have received a few letters to the editor, we still are eager to hear from the readership. We will consider publishing your views and opinions on things lunar.


79001/2 CORE
20
18
16
14
12
10
FeO (WT %)
79002
79001
0
10
20
30
40
50
DEPTH (CM)


79001/2 CORE
120
100
80
60
40
20
I_S/FeO
79002
79001
MATURE
SUBMATURE
IMMATURE
0
10
20
30
40
50
DEPTH (CM)

DRIVE TUBE 79001 (First Dissection)



Dark/Light Boundary

Light/Dark Boundary

Depth (cm)	Depth from Surface	<1 mm Fraction Sample No.	<1 mm Fraction Sample Wt.	>1 mm Fraction Sample No.	>1 mm Fraction Sample Wt.	Special Samples No.	Special Samples Wt.	Special Samples Type
0.5	17.9	10	1.199	11	0.453			
1.0	18.4	12	0.754	13	0.198			
1.5	18.9	14	1.231	15	0.283			
2.0	19.4	16	1.455	17	0.144			
2.5	19.9	18	1.949	19	0.149			
3.0	20.4	20	1.369	21	0.326			
3.5	20.9	22	1.251	23	0.542			
4.0	21.4	24	1.842	25	0.388			
4.5	21.9	26	1.776	27	0.617			
5.0	22.4	28	2.026	29	0.105			
5.5	22.9	30	2.013	31	0.328			
6.0	23.4	32	1.769	33	0.215			
6.5	23.9	34	2.030	35	0.689			
7.0	24.4	36	2.021	37	0.204			
7.5	24.9	38	1.978	39	0.266			
8.0	25.4	40	1.953	41	0.081			
8.5	25.9	42	1.538	43	0.158			
9.0	26.4	44	1.936	45	0.439	46	0.849	Basalt(?)
9.5	26.9	47	2.436	48	0.190			
10.0	27.4	49	2.566	50	0.134			
10.5	27.9	51	1.991	52	0.167			
11.0	28.4	53	2.466	54	0.146			
11.5	28.9	55	2.485	56	0.211			
12.0	29.4	57	1.858	58	0.234			
12.5	29.9	59	2.338	60	0.284			
13.0	30.4	61	2.534	62	0.305			
13.5	30.9	63	2.423	64	0.292			
14.0	31.4	65	2.116	66	0.228			
14.5	31.9	67	1.764	68	0.670			
15.0	32.4	69	2.249	70	0.198			
15.5	32.9	71	2.054	72	0.716			
16.0	33.4	73	1.874	74	0.297			
16.5	33.9	75	2.020	76	0.491			
17.0	34.4	77	2.245	78	0.336			
17.5	34.9	79	2.607	80	1.187			
18.0	35.4	81	2.282	82	0.196			
18.5	35.9	83	2.481	84	0.066			
19.0	36.4	85	2.197	86	0.076			
19.5	36.9	87	2.619	88	0.162			
20.0	37.4	89	2.216	90	0.079			
20.5	37.9	91	2.354	92	0.091			
21.0	38.4	93	2.726	94	0.358			
21.5	38.9	95	2.244	96	0.296			
22.0	39.4	97	2.134	98	0.252			
22.5	39.9	99	1.381	100	0.908	101	1.409	Basalt(?)
23.0	40.4	102	1.282	103	1.003			
23.5	40.9	104	0.540	105	0.185			
24.0	41.4	106	0.550	107	0.584	116	1.566	Basalt w/olivine phenocrysts
24.5	41.9	108	0.553	109	0.324	110	1.112	Basalt w/olivine phenocrysts
25.0	42.4	111	0.768	112	0.504	113	0.487	Basalt w/olivine phenocrysts
25.5	42.9	114	1.303	115	1.154			
26.0	43.4	119	1.408	120	0.163			
26.5	43.9	121	1.779	122	0.491			
27.0	44.4	123	2.238	124	0.192			
27.5	44.9	125	2.142	126	0.156			
28.0	45.4	127	2.061	128	0.190			
28.5	45.9	129	2.209	130	0.441			
29.0	46.4	131	2.128	132	0.249			
29.3	46.7	133	1.509	134	0.393			

White fragments or Lt gray bx

Glass or glassy fragments

Basalt w/olivine phenocrysts

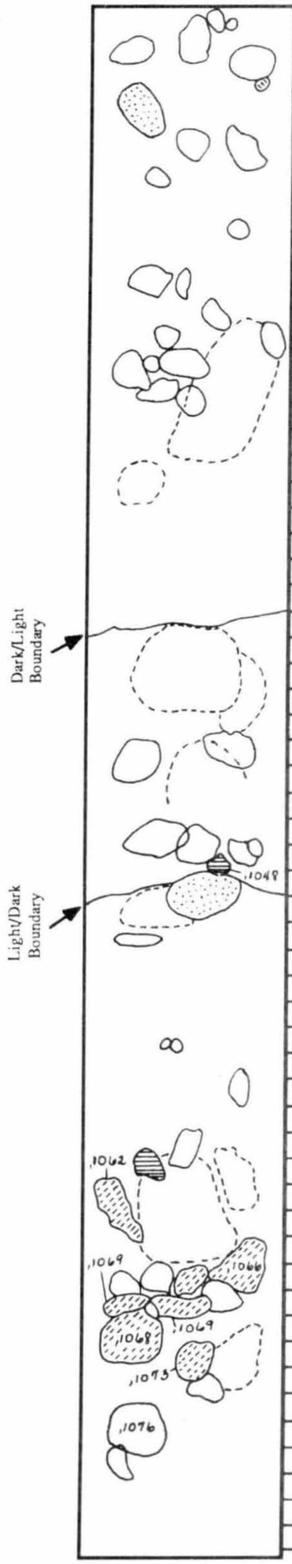
Basalt

Bx

Soil bx or soil clods

-- Fragment left in place

DRIVE TUBE 79001 (Second Dissection)



Depth (cm)	Unsieved Sample No.	Unsieved Sample Wt.	Special Samples No.	Special Samples Wt.	Special Samples Type
0.5	1015	2.544			
1.0	1016	3.280			
1.5	1017	2.984			
2.0	1018	3.498			
2.5	1019	2.804			
3.0	1020	3.667			
3.5	1021	2.605			
4.0	1022	3.307			
4.5	1023	3.571			
5.0	1024	3.212			
5.5	1025	3.503			
6.0	1026	2.943			
6.5	1027	3.396			
7.0	1028	3.143			
7.5	1029	2.073			
8.0	1030	1.867			
8.5	1031	2.374			
9.0	1032	3.084			
9.5	1033	3.308			
10.0	1034	3.211			
10.5	1035	3.263			
11.0	1036	2.815			
11.5	1037	2.887			
12.0	1038	3.201			
12.5	1039	2.415			
13.0	1040	2.068			
13.5	1041	2.327			
14.0	1042	2.990			
14.5	1043	3.727			
15.0	1044	2.964			
15.5	1045	3.322			
16.0	1046	4.092			
16.5	1047	4.214	1048	0.027	Dk. Greenish Glass
17.0	1049	2.008			
17.5	1050	3.829			
18.0	1051	2.758			
18.5	1052	3.951			
19.0	1053	2.617			
19.5	1054	3.216			
20.0	1055	2.708			
20.5	1056	3.880			
21.0	1057	4.078			
21.5	1058	3.423			
22.0	1059	3.348			
22.5	1060	2.773			
23.0	1061	1.500	1062	1.547	Basalt w/olivine phenocrysts
23.5	1063	0.824			
24.0	1064	0.918	1066	0.489	Basalt w/olivine phenocrysts
24.5	1065	3.169			
25.0	1067	3.371	1069	1.396	Basalt w/olivine phenocrysts
25.5	1070	1.763	1068	1.978	Basalt w/olivine phenocrysts (?)
26.0	1071	2.086	1073	1.076	Basalt w/olivine phenocrysts
26.5	1072	2.237			
27.0	1074	2.944			
27.5	1075	3.405	1076	1.340	?
28.0	1077	3.082			
28.5	1078	2.707			
29.0	1079	3.409			
29.3	1080	2.643			

Glass Sphere

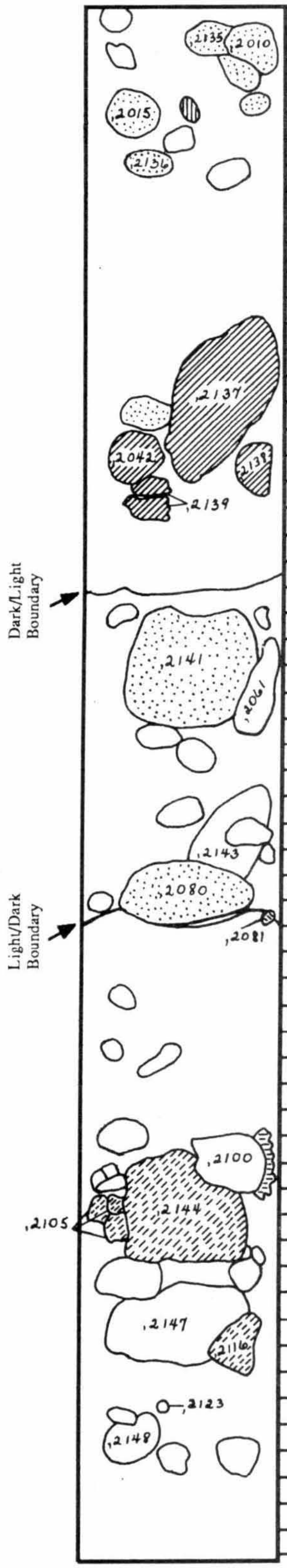
Glass

Basalt w/olivine phenocrysts

Soil Clod

- - - Fragment left in place

DRIVE TUBE 79001 (Third Dissection)



Depth (cm)	<1 mm Fraction Sample No.	Wt.	>1 mm Fraction Sample No.	Wt.	Special Samples No.	Wt.	Type
0.5	2006	2.493	2007	0.336	2135	0.985	Soil Clod
1.0	2008	2.586	2009	0.521	2010	0.636	Soil Clod
1.5	2011	2.092	2012	0.803			
2.0	2013	3.160	2014	0.720	2015	0.506	Soil Clod
2.5	2016	2.499	2017	0.323			
3.0	2018	2.059	2019	0.387	2136	0.710	Soil Clod
3.5	2020	3.275	2021	0.454			
4.0	2022	2.934	2023	0.426			
4.5	2024	2.317	2025	0.238			
5.0	2026	2.853	2027	0.313			
5.5	2028	2.935	2029	0.348			
6.0	2030	3.040	2031	0.475			
6.5	2032	2.261	2033	0.152			
7.0	2034	2.306	2035	0.287			
7.5	2036	2.409	2037	0.340	2137	15.108	Basalt
8.0	2038	1.942	2039	0.489			
8.5	2040	1.343	2041	0.168	2042	1.299	Basalt
9.0	2043	1.612	2044	0.178	2138	0.407	Basalt
9.5	2045	2.272	2046	0.243	2139	2.743	Basalt
10.0	2047	2.614	2048	0.109			
10.5	2049	2.825	2050	0.169			
11.0	2051	3.458	2052	0.301			
11.5	2053	2.951	2054	0.240			
12.0	2055	2.025	2056	0.389			
12.5	2057	1.010	2058	0.153	2141	9.423	Breccia
13.0	2059	1.681	2060	0.195	2061	2.641	Basalt?
13.5	2062	1.999	2063	0.274			
14.0	2064	3.021	2065	0.728			
14.5	2066	2.630	2067	0.519			
15.0	2068	3.080	2069	0.176			
15.5	2070	2.410	2071	0.323			
16.0	2072	2.814	2073	0.352	2143	5.727	?
16.5	2074	2.407	2075	0.459			
17.0	2076	1.895	2077	0.290	2080	1.827	Breccia(?)
17.5	2078	2.656	2079	0.407	2081	0.072	Glass sphere
18.0	2082	2.671	2083	0.200			
18.5	2084	3.258	2085	0.216			
19.0	2086	3.453	2087	0.264			
19.5	2088	3.353	2089	0.061			
20.0	2090	2.900	2091	0.546			
20.5	2092	2.669	2093	0.193			
21.0	2094	2.964	2095	0.130			
21.5	2096	3.384	2097	0.219	2146	0.333	Agglutinate
22.0	2098	2.341	2099	0.322	2100	1.634	?
22.5	2101	1.569	2102	0.707	2144	20.766	Basalt w/olivine phenocrysts
23.0	2103	1.185	2104	0.981	2105	1.149	Basalt w/olivine phenocrysts
23.5	2106	0.613	2107	0.275			
24.0	2108	0.994	2109	0.963			
24.5	2110	1.429	2111	1.442			
25.0	2112	1.514	2113	0.298	2147	10.158	?
25.5	2114	1.734	2115	0.355	2116	1.806	Basalt w/olivine phenocrysts
26.0	2117	2.489	2118	0.242			
26.5	2119	3.191	2120	0.284			
27.0	2121	2.688	2122	0.299	2123	0.049	Glass sphere
27.5	2124	2.583	2125	0.157	2148	0.555	?
28.0	2126	2.623	2127	0.680			
28.5	2128	2.879	2129	0.140			
29.0	2130	2.871	2131	0.180			
29.3	2132	2.129	2133	0.396			

Anorthosite plagioclase, white stuff

Glass Sphere

Glass

Basalt w/olivine phenocrysts

Basalt

Soil Clod or Soil Breccia

- - Fragment left in place

NASA-JSC