Antarctic Meteorite Newsletter

Volume 19, Number 2 August 1996

A periodical issued by the Meteorite Working Group to inform scientists of the basic characteristics of specimens recovered in the Antarctic.

Edited by Cecilia Satterwhite and Marilyn Lindstrom, Code SN2, NASA Johnson Space Center, Houston, Texas 77058

New Meteorites

This newsletter announces the availability of 194 new meteorites, mostly from the 1994 ANSMET collection. It also announces the first 8 meteorites from the 1995 collection. Included among these samples are 3 irons, 2 mesosiderites, 2 carbonaceous chondrites, 3 type 3 ordinary chondrites and 6 achondrites (1 ureilite and 5 HED). The most unusual is diogenite GRO95555. It has the mineralogy of a diogenite, but its unbrecciated, unshocked granular texture is unique. Stay tuned to our web page for further information.

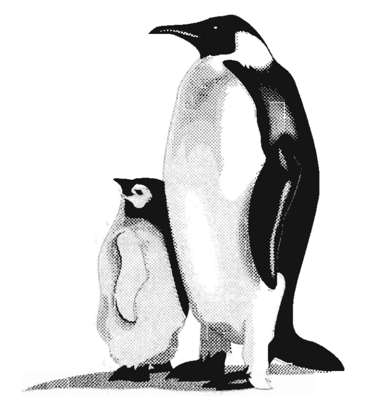
Life on Mars?

NASA announced last week that Antarctic meteorite ALH84001 contains possible evidence of past life on Mars. The evaluation of these findings will no doubt occupy our scientific community in the months and years to come. This meteorite was reclassified as martian in 1993 and subsequent studies showed it to be unusual in its ancient age and relatively large carbonate weathering products. Our web page contains lots of information on martian meteorites and ALH84001. Stay tuned to the web for updates and plans for allocation and future studies.

Score: *JSC Meteorite Lab 0*
Antarctica 1

After 18 years in curation at JSC Robbie Score left us in May for a new job with Antarctic Support Associates in Denver and McMurdo. Robbie was involved in setting up meteorite processing at JSC. She worked as a processor and later became meteorite lab manager and MWG Secretary. She was well known to the meteorite community and helped many researchers formulate requests and select samples. Robbie's last meteorite description appears in this newsletter. She left us something else to remember her by. One of the field team members mentioned that Robbie was the one who picked up martian meteorite ALH84001 in Antarctica. Now Robbie is a celebrity who has appeared in newspapers, radio and TV. We miss her already and wish her all the best in her new job.

Inside this Issue



Sample Request Deadline
September 10, 1996

MWG Meets
September 27-28, 1996

Sample Request Guidelines

All sample requests should be made in writing to:

Secretary, MWG
SN2/Office of the Curator
NASA Johnson Space Center
Houston, TX 77058 USA

Requests that are received by the MWG Secretary before Sept. 10, 1996, will be reviewed at the MWG meeting on Sept. 27-28, 1996, to be held in Washington, DC. Requests that are received after the Sept. 10 deadline may possibly be delayed for review until the MWG meets again in the Spring of 1997. PLEASE SUBMIT YOUR REQUESTS ON TIME. Questions pertaining to sample requests can be directed in writing to the above address or can be directed to the curator by phone, FAX, or e-mail.

Requests for samples are welcomed from research scientists of all countries, regardless of their current state of funding for meteorite studies. Graduate student requests should be initialed or countersigned by a supervising scientist to confirm access to facilities for analysis. All sample requests will be reviewed in a timely manner. Those requests that do not meet the JSC Curatorial Guidelines will be reviewed by the Meteorite Working Group (MWG), a peer-review committee which meets twice a year to guide the collection, curation, allocation, and distribution of the U.S. collection of Antarctic meteorites. Issuance of samples does not imply a commitment by any agency to fund the proposed research. Requests for financial support must be submitted separately to the appropriate funding agencies. As a matter of policy, U.S. Antarctic meteorites are the property of the National Science Foundation and all allocations are subject to recall.

Each request should accurately refer to meteorite samples by their respective identification numbers. Specific requirements for sample types within individual specimens, or special handling or shipping procedures should be explained in each request. Each request should include a brief justification, which should contain: 1) what scientific problem will be addressed; 2) what analytical approach will be used; 3) what sample masses are required; 4) evidence that the proposed analyses can be performed by the requester or collaborators; and 5) why Antarctic meteorites are best suitable for the investigation. For new or innovative investigations, proposers are encouraged to supply additional detailed information in order to assist the MWG. Requests for thin sections which will be used in destructive procedures such as ion probing, etching, or even repolishing, must be stated explicitly. Consortium requests must be initialed or countersigned by a member of each group in the consortium. All necessary information, in most cases, should be condensable into a one-or two-page letter.

Samples can be requested from any meteorite that has been made available through announcement in any issue of the *Antarctic Meteorite Newsletter* (beginning with 1 (1) in June, 1978). Many of the meteorites have also been described in five *Smithsonian Contr. Earth Sci.:* Nos. 23, 24, 26, 28, and 30. A table containing all classifications as of December 1993 is published in *Meteoritics* 29, p. 100-142 and updated as of April 1996 in *Meteoritics and Planetary Science* 31, p. A161-A174.

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New Meteorites

From 1993-1995 Collections

Pages 4-13 contain preliminary descriptions and classifications of meteorites that were completed since publication of issue 19(1), February 1996. Specimens of special petrologic type (carbonaceous chondrite, unequilibrated ordinary chondrite, achondrite, etc.) are represented by separate descriptions unless they are paired with previously described meteorites. However, some specimens of non-special petrologic type are listed only as single line entries in Table 1. For convenience, new specimens of special petrological type are also recast in Table 2.

Macroscopic descriptions of stony meteorites were performed at NASA/ JSC. These descriptions summarize hand-specimen features observed during inital examination. Classification is based on microscopic petrography and reconnaissance-level electron microprobe analyses using polished sections prepared from a small chip of each meteorite. For each stony meteorite the sample number assigned to the preliminary examination section is included. In some cases, however, a single microscopic description was based on thin sections of several specimens believed to be members of a single fall.

Meteorite descriptions contained in this issue were contributed by the following individuals:

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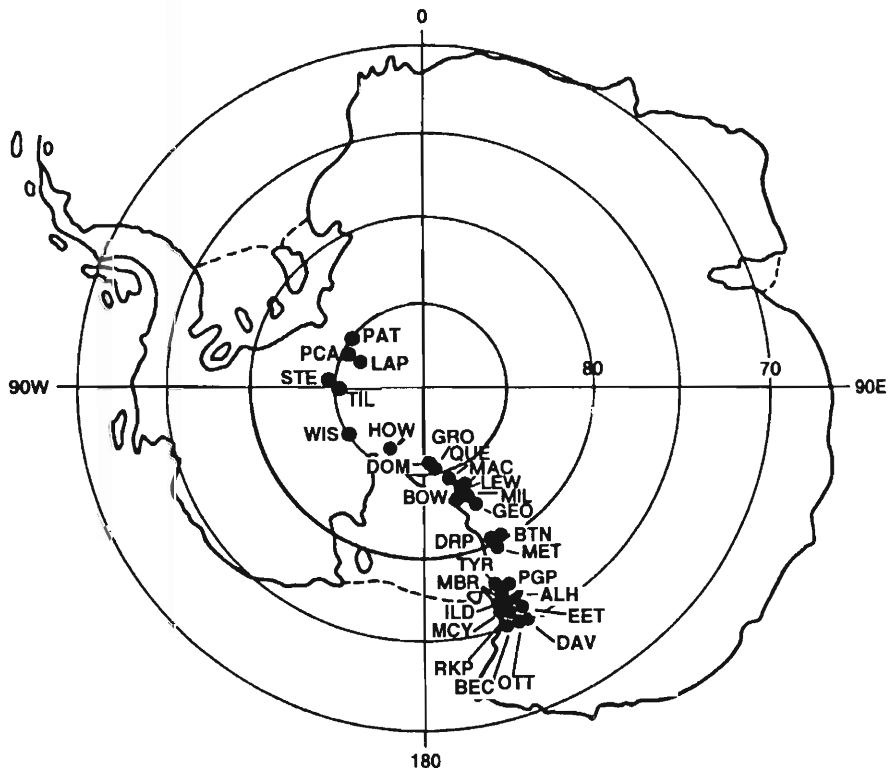
Antarctic Meteorite Locations

ALH — Allan Hills
BEC — Beckett Nunatak
BOW — Bowden Neve
BTN — Bates Nunataks
DAV — David Glacier
DOM — Dominion Range
DRP — Derrick Peak
EET — Elephant Moraine
GEO — Geologists Range
GRO — Grosvenor Mountains
HOW — Mt. Howe
ILD — Inland Forts
LAP — LaPaz Ice Field
LEW — Lewis Cliff
LON — Lonewolf Nunataks
MAC — MacAlpine Hills
MBR — Mount Baldr
MCY — MacKay Glacier
MET — Meteorite Hills
MIL — Miller Range
OTT — Outpost Nunatak
PAT — Patuxent Range
PCA — Pecora Escarpment
PGP — Purgatory Peak
QUE — Queen Alexandria Range
RKP — Reckling Peak
STE — Stewart Hills
TIL — Thiel Mountains
TYR — Taylor Glacier
WIS — Wisconsin Range



Information on the U.S. Collection of Antarctic Meteorites

Number of meteorites:	7857
Number of meteorites classified:	7492

Table 1: List of Newly Classified Antarctic Meteorites**

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 93757 ~	1.3	L6 CHONDRITE	B/C	A		
ALH 94001	196.5	L4 CHONDRITE	A/Be	A	25	21
ALH 94002 ~	8.9	L6 CHONDRITE	A/B	A		
ALH 94003	90.2	H5 CHONDRITE	B	A	18	16
ALH 94004 ~	5.6	H5 CHONDRITE	Be	A/B		
ALH 94005	8.2	H5 CHONDRITE	B	A	19	16
ALH 94006	13.5	H6 CHONDRITE	A/B	A	18	16
ALH 94007	1.2	L3.4 CHONDRITE	C	B/C	7-38	1-21
ALH 94008 ~	6.3	H6 CHONDRITE	A	A		
ALH 94009 ~	25.3	L6 CHONDRITE	B	A		
ALH 94010 ~	8.0	L6 CHONDRITE	A	A		
ALH 94011 ~	2.4	L6 CHONDRITE	A/B	A		
ALH 94012 ~	9.0	L4 CHONDRITE	A/B	A/B		
ALH 94013 ~	10.6	L6 CHONDRITE	B	A/B		
ALH 94014 ~	22.9	L6 CHONDRITE	A/B	A		
ALH 94015 ~	8.1	L6 CHONDRITE	B	A		
ALH 94016 ~	9.8	L6 CHONDRITE	A	A		
ALH 94017 ~	9.6	L6 CHONDRITE	B	A/B		
ALH 94018 ~	36.3	L6 CHONDRITE	A	B		
ALH 94019 ~	6.1	L6 CHONDRITE	A	B		
ALH 94020 ~	14.3	L6 CHONDRITE	A/B	B		
QUE 94610	2.6	H5 CHONDRITE	B	B	18	16
QUE 94611 ~	13.6	L6 CHONDRITE	B	B/C		
QUE 94612 ~	1.2	LL6 CHONDRITE	B	B/C		
QUE 94613	5.1	UREILITE	B	B	22-24	19
QUE 94614	2.5	MESOSIDERITE	B/C	B/C		22-37
QUE 94615 ~	26.8	L5 CHONDRITE	A/B	A/B		
QUE 94616	13.6	HOWARDITE	B/C	B/C	59-62	17-58
QUE 94617 ~	24.7	L5 CHONDRITE	A/B	B		
QUE 94618 ~	28.4	L5 CHONDRITE	A/B	B		
QUE 94619 ~	16.2	L5 CHONDRITE	A/B	B		
QUE 94620 ~	59.9	L5 CHONDRITE	B	B		
QUE 94621 ~	47.2	L5 CHONDRITE	B	A		
QUE 94622 ~	17.7	L5 CHONDRITE	B	A		
QUE 94623 ~	114.8	L6 CHONDRITE	B	A		
QUE 94624 ~	28.6	LL6 CHONDRITE	A/B	A		
QUE 94625 ~	27.9	L5 CHONDRITE	B	A		
QUE 94626	30.5	H5 CHONDRITE	B/C	B	18	16
QUE 94627	30.5	IRON	B	A		
QUE 94628 ~	7.3	LL6 CHONDRITE	A/B	A		
QUE 94629 ~	67.6	L5 CHONDRITE	B	B		
QUE 94630 ~	56.9	L5 CHONDRITE	B	B		
QUE 94631 ~	15.7	LL6 CHONDRITE	A/B	A		
QUE 94632 ~	34.3	L5 CHONDRITE	B	B		
QUE 94633 ~	63.9	L5 CHONDRITE	Be	B		
QUE 94634 ~	56.9	L5 CHONDRITE	B	B		

~Classified by using refractive indices. #Reclassed by A. Krot. @Reclassed by A. Rubin

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 94635 ~	20.5	L5 CHONDRITE	A/B	A		
QUE 94636 ~	8.1	L5 CHONDRITE	B/C	B		
QUE 94637	0.2	H5 CHONDRITE	B	A	19	17
QUE 94638	6.6	LL6 CHONDRITE	A/B	A	30	24
QUE 94639	0.6	MESOSIDERITE	B/Ce	A		28-48
QUE 94640 ~	1.1	L6 CHONDRITE	B/C	A		
QUE 94641 ~	63.6	L5 CHONDRITE	A/B	A/B		
QUE 94642 ~	35.9	L5 CHONDRITE	A/B	A/B		
QUE 94643 ~	11.1	L6 CHONDRITE	B/C	A		
QUE 94644	0.1	H5 CHONDRITE	B	A	18	16
QUE 94645 ~	26.4	L5 CHONDRITE	A/B	A		
QUE 94646 ~	26.3	L5 CHONDRITE	A/B	A/B		
QUE 94647	16.2	L6 CHONDRITE	B	A	25	21
QUE 94648 ~	23.7	L5 CHONDRITE	A/B	A/B		
QUE 94649	0.7	H6 CHONDRITE	B/C	A	19	16
QUE 94650 ~	1.1	LL6 CHONDRITE	B	A		
QUE 94651 ~	0.6	L5 CHONDRITE	B	A		
QUE 94652	8.0	H5 CHONDRITE	B/C	A	18	16
QUE 94653	14.7	H5 CHONDRITE	B/C	A	18	16
QUE 94654 ~	11.8	LL6 CHONDRITE	A/Be	A		
QUE 94655 ~	36.1	L5 CHONDRITE	B	B		
QUE 94656 ~	18.7	L5 CHONDRITE	B	A		
QUE 94657 ~	27.2	LL6 CHONDRITE	Be	B		
QUE 94658 ~	25.8	L5 CHONDRITE	Be	A		
QUE 94659 ~	18.8	L5 CHONDRITE	B	A		
QUE 94660 ~	37.5	L5 CHONDRITE	B	A		
QUE 94661 ~	57.9	L5 CHONDRITE	B	A		
QUE 94662 ~	10.1	L5 CHONDRITE	B	A/B		
QUE 94663 ~	24.8	LL6 CHONDRITE	A/B	A		
QUE 94664 ~	10.7	L5 CHONDRITE	Be	A		
QUE 94665 ~	38.7	L5 CHONDRITE	Be	B		
QUE 94666	4.1	H5 CHONDRITE	B	A	18	16
QUE 94667 ~	32.1	L5 CHONDRITE	B	A		
QUE 94668 ~	7.0	L5 CHONDRITE	B	A		
QUE 94669	2.7	H6 CHONDRITE	B/C	A	18	16
QUE 94670 ~	26.2	LL6 CHONDRITE	A	A		
QUE 94671 ~	0.5	L6 CHONDRITE	B/C	A		
QUE 94672	20.2	H5 CHONDRITE	B/Ce	A/B	18	16
QUE 94673 ~	74.6	L5 CHONDRITE	Be	B		
QUE 94674	2.5	H5 CHONDRITE	B/C	A	19	17
QUE 94675 ~	1.2	H6 CHONDRITE	B/C	A		
QUE 94676 ~	33.0	L5 CHONDRITE	B	A/B		
QUE 94677 ~	55.9	L5 CHONDRITE	B	B		
QUE 94678 ~	13.1	L5 CHONDRITE	B	A/B		
QUE 94679	23.2	H5 CHONDRITE	B/Ce	A	19	17
QUE 94680	4.5	L6 CHONDRITE	B/Ce	A/B	24	20
QUE 94681 ~	10.1	L5 CHONDRITE	A/B	A		
QUE 94682	3.2	H5 CHONDRITE	B/C	A	18	16
QUE 94683 ~	1.4	L6 CHONDRITE	B/C	A		
QUE 94684 ~	4.4	L5 CHONDRITE	A/B	A		
QUE 94685 ~	2.1	H6 CHONDRITE	B/C	A		
QUE 94686	4.0	H5 CHONDRITE	B/C	A	18	16

~Classified by using refractive indices. #Reclassed by A. Krot. @Reclassed by A. Rubin

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 94687	18.5	H5 CHONDRITE	B/C	A	19	17
QUE 94688	10.6	CV3 CHONDRITE	B	A	1-33	1
QUE 94689 ~	2.4	L5 CHONDRITE	A/B	A		
QUE 94690 ~	2.1	L6 CHONDRITE	B/Ce	A		
QUE 94691 ~	9.6	H6 CHONDRITE	B/C	A		
QUE 94692	1.6	H5 CHONDRITE	B/C	A	19	17
QUE 94693 ~	1.8	H6 CHONDRITE	B/C	A		
QUE 94694	16.8	L5 CHONDRITE	B/Ce	A	25	21
QUE 94695 ~	12.4	L5 CHONDRITE	B	A/B		
QUE 94696 ~	3.3	L5 CHONDRITE	B	A/B		
QUE 94697 ~	18.6	L5 CHONDRITE	B	A/B		
QUE 94698	10.7	H5 CHONDRITE	B/Ce	A/B	19	17
QUE 94699	5.6	H5 CHONDRITE	B/C	A	18	16
QUE 94700 ~	3.5	H6 CHONDRITE	B/C	A		
QUE 94701 ~	2.7	L5 CHONDRITE	A/B	A		
QUE 94702 ~	1.9	L6 CHONDRITE	B/C	A		
QUE 94703 ~	9.5	L5 CHONDRITE	A/B	A/B		
QUE 94704 ~	3.0	L5 CHONDRITE	B/C	A		
QUE 94705 ~	15.9	L6 CHONDRITE	A/B	A		
QUE 94706 ~	7.2	L5 CHONDRITE	A/B	A		
QUE 94707 ~	11.0	L5 CHONDRITE	A/B	A		
QUE 94708	3.6	H5 CHONDRITE	B/Ce	A	19	17
QUE 94709 ~	14.3	L6 CHONDRITE	A/B	A		
QUE 94710 ~	2.1	H6 CHONDRITE	B/Ce	A		
QUE 94711 ~	0.9	H6 CHONDRITE	B/Ce	A		
QUE 94712	4.7	H5 CHONDRITE	Ce	A	19	16
QUE 94713 ~	2.2	H6 CHONDRITE	B/C	A		
QUE 94714 ~	118.8	L5 CHONDRITE	B	B		
QUE 94715 ~	30.1	L5 CHONDRITE	A/B	A/B		
QUE 94716 ~	128.2	L5 CHONDRITE	B	A/B		
QUE 94717 ~	21.8	LL6 CHONDRITE	A/B	A/B		
QUE 94718 ~	71.0	L5 CHONDRITE	Be	A		
QUE 94719 ~	141.1	L6 CHONDRITE	B	A		
QUE 94720 ~	39.5	L5 CHONDRITE	A/B	A		
QUE 94721 ~	5.9	H6 CHONDRITE	B/C	A		
QUE 94722	16.6	H5 CHONDRITE	B/C	A	18	16
QUE 94723 ~	17.4	L6 CHONDRITE	B/C	A		
QUE 94724 ~	2.9	H6 CHONDRITE	B/C	A		
QUE 94725 ~	2.8	L6 CHONDRITE	B/C	A		
QUE 94726 ~	1.0	L6 CHONDRITE	B/Ce	A		
QUE 94727	14.8	H5 CHONDRITE	B/C	A	18	16
QUE 94728 ~	0.1	H6 CHONDRITE	B/C	A		
QUE 94729 ~	14.9	LL6 CHONDRITE	B	A		
QUE 94730 ~	1.0	L5 CHONDRITE	A/B	A		
QUE 94731 ~	1.1	L5 CHONDRITE	A/B	A		
QUE 94732	7.4	H5 CHONDRITE	B/C	A	18	16
QUE 94733 ~	2.4	LL6 CHONDRITE	A/B	A		
QUE 94734	11.2	C2 CHONDRITE	B	A/B	1-31	1-7
QUE 94735 ~	1.1	H6 CHONDRITE	B/C	A		
QUE 94736 ~	0.3	L6 CHONDRITE	B/C	A		
QUE 94737 ~	2.4	L5 CHONDRITE	A/B	A		
QUE 94738	34.5	H5 CHONDRITE	B/C	A/B	18	16

~Classified by using refractive indices. #Reclassed by A. Krot. @Reclassed by A. Rubin

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 94739 ~	1.3	L5 CHONDRITE	A/B	A		
QUE 94740 ~	17.9	L5 CHONDRITE	B	A/B		
QUE 94742 ~	5.7	L6 CHONDRITE	B/C	A		
QUE 94743 ~	0.9	L6 CHONDRITE	B/Ce	A		
QUE 94744 ~	11.2	L5 CHONDRITE	B	A		
QUE 94745 ~	1.6	L5 CHONDRITE	B	A		
QUE 94746 ~	2.8	L6 CHONDRITE	B/C	A		
QUE 94747	2.9	H5 CHONDRITE	B	A	18	16
QUE 94748 ~	22.5	L5 CHONDRITE	B	A		
QUE 94749 ~	23.6	L5 CHONDRITE	B	B		
QUE 94750	1.2	H5 CHONDRITE	B/C	A	18	16
QUE 94751	6.7	H5 CHONDRITE	B	A	19	16
QUE 94752 ~	1.5	L6 CHONDRITE	B	A		
QUE 94753 ~	28.8	L5 CHONDRITE	A/B	A/B		
QUE 94754 ~	3.0	H6 CHONDRITE	B	A		
QUE 94755 ~	1.8	H6 CHONDRITE	B/C	A		
QUE 94757	38.3	H5 CHONDRITE	B/C	A	18	16
QUE 94758	21.3	LL6 CHONDRITE	B	A	27	22
QUE 94759 ~	3.0	LL6 CHONDRITE	B	A/B		
QUE 94760 ~	5.3	LL6 CHONDRITE	Be	A/B		
QUE 94761 ~	0.6	L6 CHONDRITE	B/Ce	A		
QUE 94762	27.1	H6 CHONDRITE	B/C	A	19	17
QUE 94763 ~	5.0	L6 CHONDRITE	B	A		
QUE 94764	7.3	H5 CHONDRITE	B/Ce	A	19	16
QUE 94765 ~	1.3	H6 CHONDRITE	B/Ce	A		
QUE 94766 ~	5.8	H6 CHONDRITE	B/Ce	A/B		
QUE 94767 ~	23.6	L6 CHONDRITE	B	B		
QUE 94768 ~	4.7	H6 CHONDRITE	B/C	A		
QUE 94769 ~	47.0	L5 CHONDRITE	B	A		
QUE 94770 ~	22.6	L5 CHONDRITE	B	B		
QUE 94771	17.4	H5 CHONDRITE	B/C	A	17	15
QUE 94772 ~	0.7	H6 CHONDRITE	B/C	A		
QUE 94773 ~	4.4	L6 CHONDRITE	B/C	A		
QUE 94774 ~	32.1	L6 CHONDRITE	B	B		
QUE 94775	1.1	L4 CHONDRITE	B	A	24	20
QUE 94776	3.3	H6 CHONDRITE	B/C	A	19	17
GRO 95511	64.4	IRON-OCTAHEDRITE				
GRO 95522	962.5	IRON-OCTAHEDRITE				
GRO 95533	613.2	EUCRITE (UNBRECCIATED)	A/B	A		60-63
GRO 95534	17.9	HOWARDITE	A/B	A		20-53
GRO 95535	53.8	HOWARDITE	A/B	A		20-53
GRO 95544	626.0	L3.5 CHONDRITE	A/B	A	7-20	1-22
GRO 95545	142.1	L3.5 CHONDRITE	B	A	1-20	4-28
GRO 95555	250.6	DIOGENITE (UNIQUE)	A/B	A/B		24

~Classified by using refractive indices. #Reclassed by A. Krot. @Reclassed by A. Rubin

Table 2: Newly Classified Specimens Listed By Type **

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
		Achondrites				
GRO 95555	250.6	DIOGENITE (UNIQUE)	A/B	A/B		24
GRO 95533	613.2	EUCRITE (UNBRECCIATED)	A/B	A		60-63
QUE 94616	13.6	HOWARDITE	B/C	B/C	59-62	17-58
GRO 95534	17.9	HOWARDITE	A/B	A		20-53
GRO 95535	53.8	HOWARDITE	A/B	A		20-53
QUE 94613	5.1	UREILITE	B	B	22-24	19
		Carbonaceous Chondrites				
QUE 94734	11.2	C2 CHONDRITE	B	A/B	1-31	1-7
QUE 94688	10.6	CV3 CHONDRITE	B	A	1-33	1
		Chondrites - Type 3				
ALH 94007	1.2	L3.4 CHONDRITE	C	B/C	7-38	1-21
GRO 95544	626.0	L3.5 CHONDRITE	A/B	A	7-20	1-22
GRO 95545	142.1	L3.5 CHONDRITE	B	A	1-20	4-28
		Irons				
QUE 94627	30.5	IRON	B	A		
GRO 95511	64.4	IRON-OCTAHEDRITE				
GRO 95522	962.5	IRON-OCTAHEDRITE				
		Stony-Irons				
QUE 94614	2.5	MESOSIDERITE	B/C	B/C		22-37
QUE 94639	0.6	MESOSIDERITE	B/Ce	A		28-48

~Classified by using refractive indices. #Reclassed by A. Krot. @Reclassed by A. Rubin

Table 3: Tentative Pairings for New Specimens

Table 3 summarizes possible pairings of the new specimens with each other and with previously classified specimens, based on descriptive data in this newsletter issue. Readers who desire a more comprehensive review of the meteorite pairings in the U.S. Antarctic collection should refer to the compilation provided by Dr. E.R. D. Scott, as published in issue 9(2) (June 1986). Possible pairings were updated in Meteoritical Bulletin No. 76, Meteoritics 29, 100-143 (1994).

CV3 CHONDRITE
QUE 94688 with QUE 93429

HOWARDITE
GRO 95534 and GRO 95535

IRON
QUE 94627 with QUE 94411

L3.5 CHONDRITE
GRO 95544 and GRO 95545

MESOSIDERITE
QUE 94614, 94639 with QUE 86900

UREILITE
QUE 94613 with QUE 93336

**Notes to Tables 1 and 2:

"Weathering" Categories:

A: Minor rustiness; rust haloes on metal particles and rust stains along fractures are minor.
B: Moderate rustiness; large rust haloes occur on metal particles and rust stains on internal fractures are extensive.
C: Severe rustiness; metal particles have been mostly stained by rust throughout.
e: Evaporite minerals visible to the naked eye.

"Fracturing" Categories:

A: Minor cracks; few or no cracks are conspicuous to the naked eye and no cracks penetrate the entire specimen.
B: Moderate cracks; several cracks extend across exterior surfaces and the specimen can be readily broken along the cracks.
C: Severe cracks; specimen readily crumbles along cracks that are both extensive and abundant.

Petrographic Descriptions

Sample No.: ALH94007
Location: Allan Hills
Dimensions (cm): 1.5 x 1.0 x 0.75
Weight (g): 1.24
Meteorite Type: L3 Chondrite (estimated L3.4)

Macroscopic Description: Kathleen McBride
The exterior surface of this meteorite is weathered brown with thin patches of fusion crust. Fractures penetrate the surface. The interior is brown with heavy oxidation and some metal visible.

Thin Section (,2) Description: Brian Mason
The section shows numerous chondrules (up to 1.8 mm across), chondrule fragments, and mineral grains in a black matrix that contains a small amount of nickel-iron and troilite. The meteorite is considerably weathered, with limonitic staining and patches of brown limonite throughout the section. Microprobe analyses show olivine and pyroxene of variable composition: olivine, Fa_{7-38}, mean Fa_{17}: pyroxene, Fa_{1-21}. The meteorite is classified as an L3 chondrite (estimated L3.4).

Sample No.: QUE94613
Location: Queen Alexandra Range
Dimensions (cm): 2.0 x 1.5 x 1.0
Weight (g): 5.1
Meteorite Type: Ureilite

Macroscopic Description: Kathleen McBride
Forty percent of the exterior of this meteorite is covered with dark brown to black fusion crust. Areas without fusion crust are rusty brown in color. The interior is dull brown to black with some metal grains and some weathered mineral grains visible.

Thin Section (,2) Description: Brian Mason
The section shows anhedral grains of olivine and a little pyroxene (grains up to 2.4 mm across) in a black matrix. The matrix contains veinlets of brown limonite, presumably from the weathering of metal and sulfide. Microprobe analyses show olivine of nearly uniform composition, Fa_{22-24}, with notably high CaO (0.4%); pyroxene composition is $Wo_{10}Fs_{19}$. The meteorite is a ureilite; it appears to be relatively unshocked compared to most ureilites. It is probably paired with QUE93336 and 93341.

Sample No.: QUE94614
Location: Queen Alexandra Range
Dimensions (cm): 1.5 x 1.5 x 0.5
Weight (g): 2.5
Meteorite Type: Mesosiderite

Macroscopic Description: Kathleen McBride
Thin, black shiny patches of fusion crust are present on this meteorite's exterior surface. Areas without fusion crust are weathered brown. The interior is brown and fine grained. A few mineral grains are visible and oxidation is present.

Thin Section (,2) Description: Brian Mason
The section shows plagioclase and pyroxene clasts, up to 1.5 mm across, in an opaque matrix of nickel-iron and troilite (the nickel-iron extensively weathered to brown limonite). Most of the pyroxene is hypersthene, with compositions clustered around Wo_2Fs_{24}, but a few calcium-rich grains were analyzed, up to $Wo_{34}Fs_{32}$. Plagioclase compositions are An_{91-96}. Trace amounts of an SiO_2 polymorph, probably tridymite, are present. The meteorite is a mesosiderite; it is very similar to QUE86900, with which it is probably paired.

Sample No: QUE94616
Location: Queen Alexandra Range
Dimensions (cm): 3.0 x 2.5 x 1.5
Weight (g): 13.6
Meteorite Type: Howardite

Macroscopic Description: Kathleen McBride
The exterior surface of this achondrite is dark gray in color with a small patch of black fusion crust. The exterior has a pebbly texture. The interior reveals a dirty gray matrix with abundant mm-sized white, black and gray inclusions. Minor oxidation is visible.

Thin Section (,2) Description: Brian Mason
The section shows a microbreccia of pyroxene and plagioclase clasts in a comminuted groundmass of these minerals; the groundmass contains a few small grains of opaques. The pyroxene is orthopyroxene with a lesser amount of pigeonite; orthopyroxene clasts are up to 1.5 mm across, whereas pigeonite clasts are smaller. Microprobe analyses show othropyroxene of essentially uniform composition, Wo_3Fs_{24}, and a wide range of pigeonite compositions, Wo_{5-30}, Fs_{17-58}. Plagioclase composition is An_{74-92}. Two grains of olivine, Fa_{59}, Fa_{62}, were analyzed. The meteorite is a howardite.

Sample No.: QUE94639
Location: Queen Alexandra Range
Dimensions (cm): 1.1 x 1.0 x 0.2
Weight (g): 0.6
Meteorite Type: Mesosiderite

Macroscopic Description: Carol Schwarz
The exterior surface of this small flat fragment is dark brown with a few mm-sized yellow and green mineral grains visible. Some evaporite is also present. The interior is dark brown, mostly metal, with yellow and brown crystals scattered throughout.

Thin Section (,2) Description: Brian Mason
This section shows plagioclase and pyroxene clasts, up to 1.2 mm across, in an opaque matrix of nickel-iron and troilite (the nickel-iron extensively weathered to limonite). Most of the pyroxene is hypersthene, with composition near Wo_3Fs_{28}, but one grain of augite, $Wo_{40}Fs_{27}$, was analyzed. Plagioclase composition is An_{91-96}. One grain of tridymite was analyzed. The meteorite is a mesosiderite, and can be confidently paired with QUE86900.

Sample No.:	QUE94688
Location:	Queen Alexandra Range
Dimensions (cm):	2.2 x 1.8 x 1.1
Weight (g):	10.55
Meteorite Type:	CV3 Chondrite

Macroscopic Description: Cecilia E. Satterwhite
Dull black fusion crust covers sixty percent of the exterior of this carbonaceous chondrite. The interior reveals a black fine grained matrix with some weathered inclusions. White mm-sized inclusions are abundant on the exterior and interior surfaces.

Thin Section (,2) Description: Brian Mason
The section shows numerous chondrules (up to 1.8 mm across), irregular aggregates, and mineral grains in a black matrix. A small amount of nickel-iron and troilite is present at the rims and within the chondrules. Microprobe analyses show that most of the olivine in the chondrules is close to Mg_2SiO_4 in composition, but olivine grains in the matrix are more iron-rich, ranging up to Fa_{33}; pyroxene is rare, a single grain measured was Fs_1. The matrix appears to consist largely of iron-rich olivine, about Fa_{45}. The meteorite is classified as a C3 chondrite of the Vigarano subtype; it is very similar to QUE93429, and the possibility of pairing should be considered.

Sample No.:	QUE94734
Location:	Queen Alexandra Range
Dimensions (cm):	3.0 x 2.1 x 2.0
Weight (g):	11.17
Meteorite Type:	C2 Chondrite

Macroscopic Description: Cecilia E. Satterwhite
Fifty percent of the exterior of this carbonaceous chondrite is covered with fractured black fusion crust. Flow lines are present on the fusion crust on some surfaces. Areas without fusion crust are dull and brownish gray in color. The interior reveals a black fine grained matrix with mm-sized gray inclusions.

Thin Section (,2) Description: Brian Mason
The section shows sparse chondrules, up to 0.9 mm across, some irregular aggregates, and numerous small silicate grains in a dark brown to black matrix. The silicate grains are almost entirely olivine near Mg_2SiO_4 in composition, with a few more iron-rich grains. A little pyroxene near $MgSiO_3$ in composition is present. The matrix appears to consist largely of iron-rich serpentine. The meteorite is a C2 chondrite.

Sample No.:	GRO95511
Location:	Grosvenor Mountains
Dimensions (cm):	3.6 x 3.0 x 1.5
Weight (g):	64.4
Meteorite Type:	Iron - Coarse Octahedrite

Macroscopic Description: Roy S. Clarke, Jr.
This oval-shaped button was oriented during atmospheric passage, resulting in a domed anterior surface with a flat posterior. A thin film of reddish brown to black secondary oxides covers the specimen. There is a suggestion of an accumulation of material at the rim where the two surface types join, but fusion crust is not apparent. The internal Widmanstatten pattern stands out in relief on the anterior surface, while the posterior surface is matted terrestrial oxides.

Polished Section Description: Roy S. Clarke, Jr.
A median slice perpendicular to both the long axis of the oval and to the flat posterior surface was removed, producing butts of 27.5 g and 20.7g, and a 3.1 mm slice of 7.7 g from which a metallographic section was prepared. Fusion crust is absent on the anterior surface, but an accumulation of columnar fusion crust is present at both ends of the posterior surface. They are ~1mm thick near the rim where the surfaces join, and taper to nothing in ~9mm. Heat alteration as indicated by a_2 structure affects all but the most interior parts of the section. The plane of section is parallel to the 100 direction of the parent taenite, resulting in a Widmanstatten pattern of kamacite bands in two orthogonal directions with widths of approximately 1.5 mm. The structure, although heat-altered, is regular and otherwise undistorted. It contains several of the more common taenite-plessite structures. Neumann bands are present in the a_2-free kamacite. Rhabdites are present within kamacite, and grain-boundary schreibersites and taenite-border schreibersites are present. Troilite was not observed but is probably present. Both GRO95511 and GRO95522 are similar in appearance and weathering history. Their Widmanstatten patterns are revealed on different planes, and they have different exposures to preterrestrial distortion and heating. This makes it difficult to suggest if they represent two separate falls or are individuals from a shower. Definitive classification and pairing information awaits trace element analysis.

Sample No.:	GRO95522
Location:	Grosvenor Mountains
Dimensions (cm):	9.4 x 8.0 x 3.0
Weight (g):	962.3
Meteorite Type:	Iron - Medium to Coarse Octahedrite

Macroscopic Description: Roy S. Clarke, Jr.
This specimen is an irregular-shaped oval with a smooth anterior surface and

a comparatively rough and irregular posterior. The gentle rounding of the anterior surface suggests oriented flight during atmospheric passage. A thin film of reddish brown to black secondary oxides covers the specimen. The internal Widmanstatten pattern stands out in slight relief over much of the anterior surface, while the posterior surface is irregular, and contains depressions apparently due to terrestrial corrosion.

Polished Section Description: Roy S. Clarke, Jr.
A median slice perpendicular to both the long axis of the oval and an approximated plane of the posterior surface was removed, producing butts of 698 g and 170 g, and a slice of 49 g. A 2.5 cm^2 piece was taken for a metallographic section. Fusion crust is absent except for a small accumulation of melt crust on the posterior surface at the rim with the anterior surface. Its maximum width is ~0.3 mm near the union of the surfaces, and it tapers to nothing by 5 mm into the interior. The slice is bordered with a heat-altered zone of ~3 mm on the anterior surface, and of generally narrower and more variable widths on the posterior surface. The plane of cut revealed three directions of the Widmanstatten pattern unequally displayed. Kamacite band widths are ~ 1.3 mm. The kamacite contains Neumann bands, many of which show mild preterrestrial distortion, as do the kamacite bands themselves. Rhabdites are not prominent, but grain-boundary schreibersite and some taenite-border schreibersite are present. Several morphologies of taenite-plessite are present. Close to the anterior surface within an area of fairly high structural distortion is a shattered, euhedral chromite (1.7 x 0.5 mm) surrounded by ~0.4 mm of troilite along the long dimension and ~0.8 at the ends. The exterior of the troilite is bordered over part of its outer edge with schreibersite, and where it is in contact with kamacite, it appears to have been partially melted. Both GRO95511 and GRO95522 are similar in appearance and weathering history. Their Widmanstatten patterns are revealed on different planes, and they have different exposures to preterrestrial distortion and heating. This makes it difficult to suggest if they represent two separate falls or are individuals from a shower. Definitive classification and pairing information awaits trace element analysis.

Sample No.:	GRO95533
Location	Grosvenor Mountains
Dimensions (cm):	13.2 x 7.1 x 5.8
Weight (g):	613.2
Meteorite Type:	Eucrite (unbrecciated)

Macroscopic Description: Robbie Ann Score
Shiny black fusion crust with well-developed flow lines covers one half of this pretty eucrite. The other surface is broken and shows minor oxidation. The interior has coarse grained graphic intergrowths of plagioclase and pyroxene. Some brown oxidation is scattered throughout.

Thin Section (,5) Description: Brian Mason
The section shows a granular aggregate of pyroxene and plagioclase (grains up to 0.9 mm). The meteorite is unbrecciated, but the individual pyroxene crystals have been granulated. Microprobe analyses show essentially uniform compositions; pyroxene, Wo_{26} Fs_{60-63}; plagioclase, An_{89-90}. The meteorite is a eucrite.

Sample No.:	GRO95534; 95535
Location:	Grosvenor Mountains
Dimensions (cm):	3.0 x 2.7 x 1.5; 3.2 x 2.5 x 2.7
Weight (g):	17.9; 53.8
Meteorite Type:	Howardite

Macroscopic Description: Cecilia E. Satterwhite
The exterior surfaces of these achondrite meteorites have smooth, shiny black fusion crust over seventy five percent of their surface. Areas where fusion crust has been plucked away reveal a gray matrix . The interior reveals a gray fine-grained texture with abundant white inclusions. A few green and black minerals are present. Minor oxidation is present.

Thin Section (GRO95534,3; 95535,5) Description: Brian Mason
The sections are so similar that a single description will suffice; the meteorites are probably paired. They show a groundmass of comminuted pyroxene (orthopyroxene and pigeonite) and plagioclase (grains up to 0.2 mm), with a few larger mineral clasts and rare polymineralic clasts up to 2.5 mm across. Microprobe analyses show a wide range in pyroxene composition: Wo_{1-40}, Fs_{20-60}, En_{33-79}, but with orthopyroxene clustered around Wo_8Fs_{53} to $Wo_{40}Fs_{27}$ with fairly uniform En content. Plagioclase composition is An_{86-93}. An SiO_2 polymorph, probably tridymite, is present in accessory amounts. The meteorites are howardites.

Sample No.:	GRO95544; 95545
Location:	Grosvenor Mountains
Dimensions (cm):	8.0 x 7.5 x 6.0; 7.0 x 5.0 x 3.0
Weight (g):	626.0;142.1
Meteorite Type:	L3 Chondrites (estimated L3.5)

Macroscopic Description: Kathleen McBride
The exterior of these meteorites have thin, patchy fusion crust. In some areas fusion crust has been weathered away. The interior is dark brown with numerous chondrules. Chondrules are white to yellow in color and measure 1 to 4 mm in size. Some appear rusty. Metal grains are present and samples are very coherent and difficult to break.

Thin Section (GRO95544,5;95545,4) Description: Brian Mason
The sections are so similar that a single description will suffice; the meteorites are probably paired. The sections show numerous chondrules and chondrule fragments, up to 2.4 mm across, in a black matrix containing small amounts of nickel-iron and troilite. The chondrules are mainly granular and porphyritic

olivine and olivine-pyroxene, with a few radiating and crytocrystalline pyroxene. Microprobe analyses show olivine and pyroxene of variable composition: olivine, Fa_{1-20}, mean Fa_{14}; pyroxene, Fs_{1-28}. The meteorites are classified as L3 chondrites (estimated L3.5).

Sample No.:	GRO95555
Location:	Grosvenor Mountains
Dimensions (cm)	6.0 x 6.0 x 5.0
Weight (g):	250.6
Meteorite Type	Diogenite (unique)

Macroscopic Description: Carol Schwarz
This specimen is angular in shape and greenish in color. There are several penetrating fractures. The exterior is somewhat polished with no fusion crust. The interior is greenish brown and crystalline with coarse-grained green and dark minerals. (It is coarser than PAT91501 (L7 Chondrite) and ALHA77005 (SNC) and contains no plagioclase.)

Thin Section (,2) Description: Brian Mason and Tim McCoy
The section shows a polygonal-granular aggregate of anhedral orthopyroxene, the grains ranging from 0.3 to 2.4 mm across. Pyroxene composition is essentially uniform, Wo_2Fs_{24}. Accessory phases include SiO_2, chromite, an iron sulfide (probably troilite), and weathering products of metal and troilite. The composition is that of a diogenite, but the texture is unique; it shows no sign of the brecciation and shock deformation characteristic of other diogenites.

Aluminum-26 Activity: Dave Lindstrom
The sample was radioassayed for Al-26 because it had no fusion crust and might have been a terrestrial rock. Estimated Al-26 activity of 50±10 dpm/hg is similar to that of diogenites and other achondrites.

Table 4: Natural Thermoluminescence (NTL) Data for Antarctic Meteorites

Paul Benoit and Derek Sears
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The measurement and data reduction methods were described by Hasan et al. (1987, Proc. 17th LPSC E703-E709); 1989, LPSC XX, 383-384). For meteorites whose TL lies between 5 and 100 krad the natural TL is related primarily to terrestrial history. Samples with NTL <5 krad have TL below that which can reasonably be ascribed to long terrestrial ages. Such meteorites have had their TL lowered by heating within the last million years or so by close solar passage, shock heating, or atmospheric entry, exacerbated, in the case of certain achondrite classes and possibly enstatite chondrites, by "ancmalous fading"

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Sample	Class	NTL [krad at 250 deg. C]
QUE94204	E7	22 +- 5
QUE94217	H5	40.7 +- 0.2
QUE94237	H5	44.4 +- 0.4
QUE94242	H5	1.5 +- 0.1
QUE94252	H5	30.6 +- 0.4
LON94104	H6	44.9 +- 0.1
QUE94243	H6	19.1 +- 0.2
QUE94229	L5	7.2 +- 0.1
QUE94240	L5	16.0 +- 0.1
QUE94246	L5	6.4 +- 0.1
QUE94304	L5	4 +- 1
QUE94360	L5	10.7 +- 0.1
QUE94380	L5	2.9 +- 0.1
LON94103	L6	0.5 +- 0.1
LON94105	L6	0.8 +- 0.1
LON94106	L6	79.4 +- 0.6
LON94107	L6	0.6 +- 0.1
LON94108	L6	16.7 +- 0.1
LON94109	L6	1.2 +- 0.1
QUE94202	L6	15 +- 5
QUE94203	L6	11 +- 1
QUE94205	L6	7.0 +- 0.1
QUE94206	L6	3 +- 1
QUE94207	L6	21 +- 9
QUE94208	L6	13 +- 5
QUE94209	L6	13 +- 5
QUE94210	L6	9 +- 2
QUE94211	L6	31.0 +- 0.1
QUE94212	L6	12 +- 2
QUE94213	L6	2.0 +- 0.9
QUE94215	L6	11 +- 1
QUE94216	L6	5 +- 1
QUE94227	L6	3 +- 1
QUE94228	L6	2.0 +- 0.9
QUE94230	L6	12 +- 2
QUE94231	L6	2.0 +- 0.5
QUE94232	L6	80.1 +- 0.1
QUE94233	L6	4 +- 1
QUE94234	L6	17 +- 5
QUE94235	L6	76 +- 1
QUE94236	L6	9 +- 2
QUE94238	L6	15.7 +- 0.1
QUE94239	L6	10 +- 4
QUE94241	L6	4 +- 1
QUE94244	L6	2.3 +- 0.1
QUE94251	L6	41.7 +- 0.1
QUE94255	L6	52.4 +- 0.1
QUE94247	LL6	4 +- 1

The quoted uncertainties are the standard deviations shown by replicate measurements on a single aliquot.

COMMENTS: The following comments are based on natural TL data, TL sensitivity, the shape of the induced glow curve, classifications, and JSC and Arkansas group sample descriptions.

QUE94202, QUE94203, QUE94205, QUE94206, QUE94207, QUE94208, QUE94209, QUE94210, QUE94212, QUE94213, QUE94215, QUE94216, QUE94227, QUE94228, QUE94230, QUE94231, QUE94233, QUE94234, QUE94236, QUE94239, and QUE94241 (all L6) may be heavily shocked.

1. Pairings (Confirmations of pairings):

   L6: QUE94203, QUE94205, QUE9R206, QUE94207, QUE94208, QUE94209, QUE94210, QUE94212, QUE94213, QUE94215, QUE94216, QUE94227, QUE94228, QUE94231, QUE94233, QUE94234, QUE94236, QUE94239, and QUE94241 with QUE94202 (AMN 19:1).

2. TL data do not confirm pairings proposed in the Newsletter:

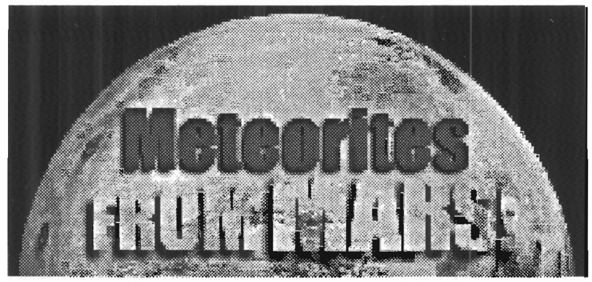
   L6: QUE94211, QUE94235, and QUE94238 with the QUE94202 group (AMN 19:1).

3. Additional pairings suggested by TL data:

   H5: QUE94237 and QUE94217.
   L5: QUE94304 and QUE94380 with the QUE90205 group (AMN 15:2).
   L5: QUE94229 and QUE94246 with the QUE90207 group (AMN 15:2).
   L6: LON94105 and LON94107 with LON94103.
   L6: QUE94212 and QUE94230 with the QUE94202 group.
   L6: QUE94235 with QUE94232.
   L6: QUE94202 group may be paired with QUE93015 (AMN 19:1).

World Wide Web Sites of Interest

Antarctic Meteorites
http://www-curator.jsc.nasa.gov/curator/antmet



Meteorites from Mars
http://www-curator.jsc.nasa.gov/curator/antmet/marsmet/text.htm

Planetary Materials
http://www-curator.jsc.nasa.gov/curator/curator.htm

The curatorial databases may be accessed as follows:

Via INTERNET	1) Type **TELNET 139.169.126.35** or **TELNET CURATE.JSC.NASA.GOV**. 2) Type **PMPUBLIC** at the USERNAME: prompt.
Via WWW	1) Using a Web browser, such as Mosaic, open URL **http://www-sn.jsc.nasa.gov/curator/curator.htm**. 2) Activate the ***Curatorial Databases*** link.
Via modem	The modem may be between 1200 and 19200 baud; no parity; 8 data bits; and 1 stop bit. If you are calling long distance, the area code is 713. 1) Dial 483-2500 for 1200-9600 bps, V.32bis/V.42bis, or 483-9498 for 1200-19200 bps, V.32bis/V.42bis. 2) Once the connection is made, press <CR>. Type **INS** in response to the Enter Number: prompt. 3) Press <CR> twice quickly until the XYPLEX#> prompt displays. 4) Type **C CURATE.JSC.NASA.GOV** at the XYPLEX#> prompt. 5) Type **PMPUBLIC** at the USERNAME: prompt.

For problems or additional information, you may contact: Claire Dardano, Lockheed Martin Engineering & Sciences Company, (713) 483-5329, dardano@snmail.jsc.nasa.gov.