Antarctic Meteorite Newsletter

Volume 31, Number 2 Sept. 2008

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 Kevin Righter, NASA Johnson Space Center, Houston, Texas 77058

Curator's Comments

Kevin Righter
NASA-JSC

Program News

This newsletter reports 315 new meteorites from the 2006 and 2007 ANSMET seasons from D'Angelo Bluff (DNG), Scott Glacier (SCO), Graves Nunataks (GRA), Larkman Nunatak (LAR), and Miller Range (MIL). These new samples include an olivine diogenite and 5 other HEDs, an aubrite, a lunar basaltic breccia, a ureilite, 4 irons, a diversity of carbonaceous chondrites (CV, CO, CM), and L and LL chondrite impact melts.

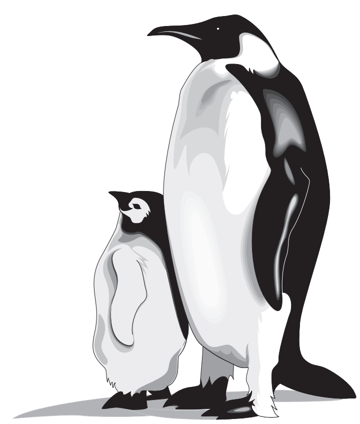
Six samples from this field season were collected asceptically by M. Fries, as part of a project to assess microbiological contamination, approved in advance by the Meteorite Working Group between 2005 and 2007. The samples are MIL 07704, MIL 07705, MIL 07706, MIL 07707, MIL 07708, and MIL 07709. The collection procedure involved personnel wearing protective clothing (cleanroom overalls, mask, sterile gloves, and booties). Sterile tongs were used to collect the samples which were placed in sterile aluminum cans, the cans were placed in aluminum foil bags and then in regular ANSMET outer bags. The main mass of each of these six specially collected samples were placed in a clean aluminum container with silica glass witness plates, and packaged and transported to JSC using the normal protocol. Other materials are also available, such as examples of the protective clothing used to collect the samples, procedural (and unopened) blanks, and skidoo exhaust. Anyone interested in requesting these samples should contact the JSC Antarctic Meteorite Lab group for additional information and details.

Otway Pairing Group and Strewnfield

We would like to bring to the attention of those who may be interested, a group of samples from near the Otway Massif in the Grosvenor Mountains region. The 03-04 ANSMET Team collected 84 fragments of a ~1.6-km long strewnfield from a blue ice area at the Otway Massif. The strewnfield is not on a relatively level ice surface but is draped over topography with a relief of 12 meters, so it is probably not an example of wind dispersion after a break up once the object resides on the ice surface (the large size of many of the fragments don't lend themselves to wind transport). These meteorites are paired with GRO 03001 and not extensively fusion crusted. Initial announce-

continued on p.2

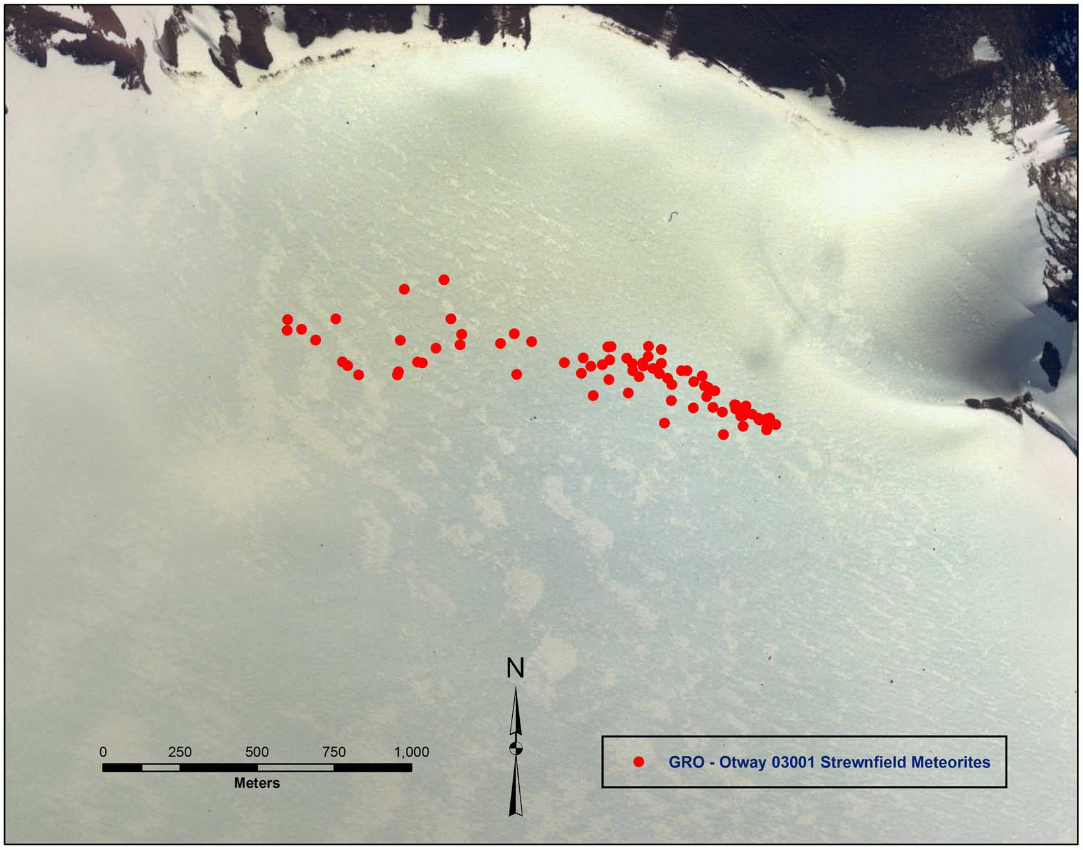
Inside this Issue



Sample Request Deadline
September 17, 2008

MWG Meets
September 29-30, 2008

ments of these samples in the Antarctic Meteorite Newsletter volumes 28 and 29 did not acknowledge or mention that they are part of a pairing group, but notes by the field team indicate that it is a large group, and that there are very few meteorites from this small area that are NOT part of the L5 pairing group. Based on the high degree of weathering of these samples, it is possible this is an old strewnfield, but a better understanding of this issue awaits terrestrial age studies. For more information about this field, see Kress et al. (2007) MAPS 42, #5270. If you are interested in the samples, please contact us about types and availability; some of the samples may be listed as LL5 or H5 in our main database and we can direct you to the most updated information about all the members of this strewnfield.



PNRA Allan Hills Meteorites Available at the Smithsonian Institution

During the 2005-2006 meteorite collection field season of the Italian Programma Nazionale delle Ricerche in Antartide (PNRA), 12 meteorites were recovered from the Allan Hills region. The entire collection of PNRA Antarctic meteorites is curated at the Museo Nazionale dell'Antartide, in Siena, Italy. The Allan Hills 06001 – 06012 meteorites published in The Meteoritical Bulletin No. 92 (see Table 4 therein) were recovered by a PNRA team during a test for geophysical instrumentations for the search for meteorites under snow cover. The selected test area was preliminarily discussed with Dr. R. Harvey and Mr. J. Schutt of the ANSMET program. In recognition of such collaborative efforts for the search for meteorites in Antarctica, representative samples of the above collection have been transferred to the Smithsonian Institution. These samples are all H5 chondrites, and are described in Meteoritical Bulletin 92 [in Meteoritics and Planetary Science 42, 1647-1694, 2007]. They are also linked to the MetBull database at:

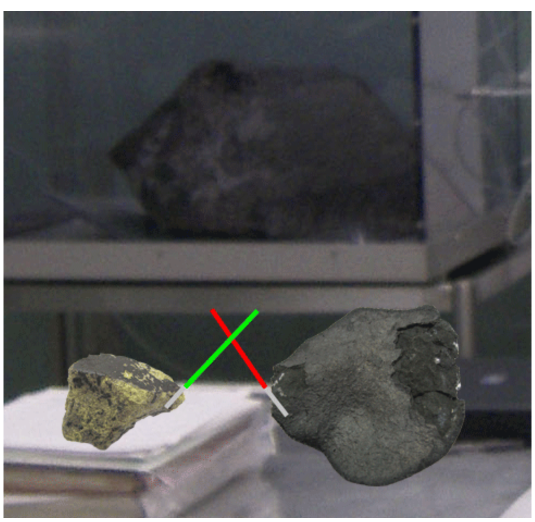
http://tin.er.usgs.gov/meteor/metbull.php

Inquiries about access to these samples should be directed to the Smithsonian Institution meteorite group.

GRA06128 and 06129 Update

The paired ungrouped achondrites announced in our August 2007 newsletter, GRA 06128 and GRA 06129, have been studied in some detail now, and we would like to present a brief update on what has been found, based on studies reported at the 2008 LPSC and MetSoc meetings. As a reminder, this unusual meteorite contains nearly 75% sodic plagioclase feldspar, along with significant amounts of olivine and pyroxene in a metamorphic equilibrated texture. The oxygen isotopic values reported in our newsletter were overlapping with the

terrestrial fractionation line, making the initial classification a challenge since they did not look like pieces of the Moon or enstatite meteorites. Several groups have now measured oxygen on acid and ethanolamine thioglycollate leached portions of the meteorite and found the oxygen to be slightly lower than the terrestrial fractionation line, and overlapping with the brachinite line (original analyses were affected by terrestrial weathering). Radiogenic isotope studies have shown it to be very old – ~4.54 Ga, and perhaps as old as brachinites. However, noble gas studies have shown that the GRA samples contain smaller excesses of ^{129}Xe and no trapped argon relative to brachinites. Petrologic and geochemical studies suggest it is possibly related to brachinites and chondrites by partial melting processes. Our understanding of these meteorites is not yet complete, and the details of these relationships will need to be worked out. Nonetheless, these initial results help to narrow down the possible source body of these meteorites to the asteroid belt. For more information about published results check out abstracts on the program pages for the 39th LPSC and the 71st Meteoritical Society meetings:
http://www.lpi.usra.edu/meetings/lpsc2008/pdf/sess401.pdf
http://www.lpi.usra.edu/meetings/lpsc2008/pdf/sess608.pdf
http://www.lpi.usra.edu/meetings/metsoc2008/pdf/sess309.pdf
http://www.lpi.usra.edu/meetings/metsoc2008/pdf/sess601.pdf



Caption Contest

Preview of the 2008-2009 ANSMET Field Season
Ralph Harvey, ANSMET

Late summer is always hectic for the ANSMET program. This is the time of year when I discover just how poorly our first-order plans are going to fit into the support available from the US Antarctic Program. 20+ years of experience with the program has taught me to be flexible. I carefully read the science-support tea leaves, hoping for no surprises and ready to make adjustments to our schedule, available flight hours, whatever it takes to get us out into the field and recovering meteorites. Just as the students return to campus, the tension is reaching a peak, with field party members worrying about passing their physicals, and roadblocks to ANSMET's schedule either coming down or diverting us in a new direction.

This summer those roadblocks have forced us onto a detour. Immediately after last season we began to see signs of shortfalls in aircraft availability, and with this in mind we planned to send a team of reduced size (6 people instead of 8) to the LaPaz icefields. In the end, even that downsizing wasn't enough, in mid-July we were told that aircraft shortages required retargeting our efforts toward an icefield closer to McMurdo. Plan B is therefore now in effect. We hope to deploy to the icefields between Mount Ward and the Davis Nunataks in early December, and traverse to the Dominion Range icefield if time allows. These icefields lie at the head of the Beardmore Glacier, and are the home of the DOM meteorites; 152 specimens were recovered from these icefields during reconnaissance visits in 1985 and 2003. The 08-09 expedition will be the first to conduct systematic searching in the region.

We expect this to be a challenging season, not only because logistical support is strained. There are a lot of terrestrial rock on the target icefields, notably the dark and glassy Kirkpatrick basalt, however, the Dominion Range area is also astoundingly beautiful and this year in particular promises some interesting historical resonance. It was in late December of 1908 that Ernest Shackleton pioneered his route up the Beardmore Glacier and on the 100th anniversary of that moment, we'll be within a few miles of where he and his colleagues (Wild, Marshall and Adams) became the first to stand on the East Antarctic Polar Plateau. Here's hoping the season brings us some of Shackleton's hardiness, wisdom, flexibility, and a few never-before-seen goodies of our own.

2006 and 2007 Collections

Pages 5-22 contain preliminary descriptions and classifications of meteorites that were completed since publication of issue 31 (1), Feb. 2008. 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 initial 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:

Kathleen McBride, Roger Harrington and Cecilia Satterwhite
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NASA Johnson Space Center
Houston, Texas

Cari Corrigan, Linda Welzenbach
Rhiannon Mayne and Tim McCoy
Department of Mineral Sciences
U.S. National Museum of Natural History
Smithsonian Institution
Washington, D.C.

Antarctic Meteorite Locations

ALH — Allan Hills
BEC — Beckett Nunatak
BOW — Bowden Neve
BTN — Bates Nunataks
CMS — Cumulus Hills
CRA — Mt.Cranfield Ice Field
CRE — Mt. Crean
DAV — David Glacier
DEW — Mt. DeWitt
DNG — D'Angelo Bluff
DOM — Dominion Range
DRP — Derrick Peak
EET — Elephant Moraine
FIN — Finger Ridge
GDR — Gardner Ridge
GEO — Geologists Range
GRA — Graves Nunataks
GRO — Grosvenor Mountains
HOW — Mt. Howe
ILD — Inland Forts
KLE — Klein Ice Field
LAP — LaPaz Ice Field
LAR — Larkman Nunatak
LEW — Lewis Cliff
LON — Lonewolf Nunataks
MAC — MacAlpine Hills
MBR — Mount Baldr
MCY — MacKay Glacier
MET — Meteorite Hills
MIL — Miller Range
ODE — Odell Glacier
OTT — Outpost Nunatak
PAT — Patuxent Range
PCA — Pecora Escarpment
PGP — Purgatory Peak
PRA — Mt. Pratt
PRE — Mt. Prestrud
QUE — Queen Alexandra Range
RBT — Roberts Massif
RKP — Reckling Peak
SAN — Sandford Cliffs
SCO — Scott Glacier
STE — Stewart Hills
TEN — Tentacle Ridge
TIL — Thiel Mountains
TYR — Taylor Glacier
WIS — Wisconsin Range
WSG — Mt. Wisting

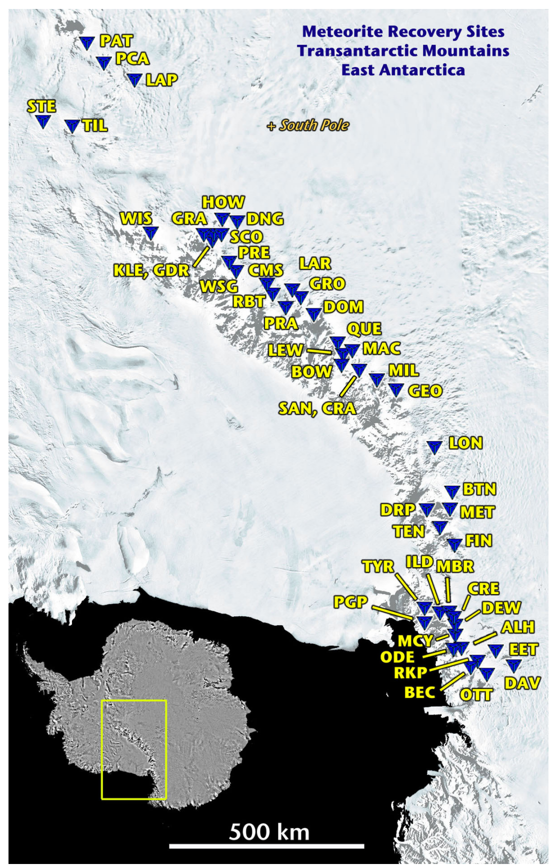

Table 1

List of Newly Classified Antarctic Meteorites **

Sample Number		Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
DNG 06001	~	26.7	L6 CHONDRITE	B/C	B		
DNG 06002	~	4.4	LL6 CHONDRITE	A/B	A/B		
DNG 06003	~	12.5	L6 CHONDRITE	B	A/B		
GRA 06103	~	1015.8	L5 CHONDRITE	C	A/B		
GRA 06104	~	5691.0	L5 CHONDRITE	B/CE	B/C		
GRA 06105	~	4155.5	L5 CHONDRITE	B/C	B/C		
GRA 06107	~	3657.4	LL5 CHONDRITE	C	B/C		
GRA 06115	~	456.3	L5 CHONDRITE	C	B		
GRA 06118	~	775.6	H5 CHONDRITE	C	B/C		
GRA 06119	~	1175.7	L6 CHONDRITE	C	B/C		
GRA 06120	~	1171.3	L5 CHONDRITE	C	C		
GRA 06121	~	1072.8	L5 CHONDRITE	A/B	B/C		
GRA 06122	~	466.3	H5 CHONDRITE	C	B		
GRA 06123	~	965.0	L5 CHONDRITE	C	A/B		
GRA 06124	~	499.1	LL5 CHONDRITE	B	B		
GRA 06125	~	487.2	L5 CHONDRITE	B	A		
GRA 06127	~	254.1	H6 CHONDRITE	B	A/B		
GRA 06132	~	136.5	L5 CHONDRITE	C	A/B		
GRA 06133	~	234.0	LL6 CHONDRITE	B	B		
GRA 06134	~	89.4	L6 CHONDRITE	CE	B/C		
GRA 06135	~	207.5	H6 CHONDRITE	C	B/C		
GRA 06136	~	170.3	L6 CHONDRITE	C	A		
GRA 06137	~	198.7	L5 CHONDRITE	B	A/B		
GRA 06138	~	134.6	L6 CHONDRITE	C	B		
GRA 06139	~	148.0	LL5 CHONDRITE	A/B	A/B		
GRA 06170	~	191.2	LL5 CHONDRITE	A	A		
GRA 06171	~	233.0	LL5 CHONDRITE	A	A		
GRA 06205	~	47.1	LL6 CHONDRITE	B	B		
GRA 06206	~	34.5	L5 CHONDRITE	B/C	B		
GRA 06207	~	50.0	LL5 CHONDRITE	B/C	B		
GRA 06208	~	36.6	L6 CHONDRITE	B/C	B		
GRA 06209	~	52.2	L5 CHONDRITE	C	B		
LAR 06250	~	4431.9	LL6 CHONDRITE	A/B	A		
LAR 06255	~	1438.6	L5 CHONDRITE	B/CE	A		
LAR 06261	~	5745.0	H5 CHONDRITE	B	B		
LAR 06262	~	7590.0	L5 CHONDRITE	B	B/C		
LAR 06263	~	4575.0	L4 CHONDRITE	B/CE	A		
LAR 06264	~	2910.0	L5 CHONDRITE	B/C	A		
LAR 06265	~	3925.0	L5 CHONDRITE	C	A/B		
LAR 06267	~	8850.0	L5 CHONDRITE	C	B		
LAR 06268	~	4265.0	LL5 CHONDRITE	C	A		
LAR 06269	~	2975.0	L5 CHONDRITE	B/CE	A/B		
LAR 06271	~	1361.5	L5 CHONDRITE	B/C	A		
LAR 06298		2208.5	LL CHONDRITE (IMPT MELT)	B	A/B	29	23
LAR 06299		751.9	LL CHONDRITE (IMPT MELT)	B	A/B	29	23
LAR 06302	~	2280.0	H5 CHONDRITE	B/C	A		
LAR 06304	~	2018.4	LL6 CHONDRITE	C	A/B		
LAR 06340	~	43.5	L5 CHONDRITE	B/C	B		

Sample Number		Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LAR 06342	~	12.9	L5 CHONDRITE	C	B		
LAR 06343		18.5	LL3 CHONDRITE	B/C	B	11-31	15-23
LAR 06344	~	26.3	L4 CHONDRITE	B/C	B		
LAR 06345	~	9.6	H6 CHONDRITE	C	B		
LAR 06346	~	37.4	H6 CHONDRITE	C	B		
LAR 06347	~	15.7	L5 CHONDRITE	B	B		
LAR 06348	~	17.6	H6 CHONDRITE	C	B		
LAR 06349	~	20.4	L4 CHONDRITE	C	B		
LAR 06350	~	16.0	H5 CHONDRITE	C	A/B		
LAR 06351	~	7.7	L6 CHONDRITE	C	A		
LAR 06352	~	4.6	H6 CHONDRITE	C	A/B		
LAR 06353	~	15.3	H6 CHONDRITE	C	B		
LAR 06354	~	31.3	L6 CHONDRITE	B	B		
LAR 06355	~	23.8	H5 CHONDRITE	C	B		
LAR 06356	~	38.5	L6 CHONDRITE	C	A/B		
LAR 06357	~	26.3	L5 CHONDRITE	B	A/B		
LAR 06358	~	20.4	L6 CHONDRITE	C	B		
LAR 06359	~	12.5	H6 CHONDRITE	C	B		
LAR 06360	~	44.9	L5 CHONDRITE	B	A		
LAR 06361	~	10.7	L6 CHONDRITE	C	B		
LAR 06362	~	9.8	L5 CHONDRITE	C	B		
LAR 06363	~	20.3	L5 CHONDRITE	CE	B		
LAR 06364	~	35.7	H6 CHONDRITE	C	C		
LAR 06365	~	44.9	L5 CHONDRITE	C	C		
LAR 06366	~	17.7	H6 CHONDRITE	C	C		
LAR 06367	~	18.5	H5 CHONDRITE	C	A		
LAR 06369	~	59.4	H5 CHONDRITE	C	B		
LAR 06430	~	51.5	H6 CHONDRITE	C	A/B		
LAR 06431	~	10.5	H6 CHONDRITE	C	A/B		
LAR 06432	~	24.3	H5 CHONDRITE	C	A/B		
LAR 06433	~	11.4	H6 CHONDRITE	C	A/B		
LAR 06434	~	13.9	L6 CHONDRITE	C	A/B		
LAR 06435	~	34.2	L6 CHONDRITE	C	A/B		
LAR 06436	~	23.6	H6 CHONDRITE	CE	A/B		
LAR 06437	~	15.6	H6 CHONDRITE	C	B		
LAR 06439	~	10.3	H6 CHONDRITE	C	B		
LAR 06440	~	12.6	H5 CHONDRITE	CE	B		
LAR 06441	~	6.1	H6 CHONDRITE	C	B		
LAR 06442	~	4.1	L6 CHONDRITE	C	A/B		
LAR 06443	~	4.9	H5 CHONDRITE	C	A/B		
LAR 06444	~	12.6	L5 CHONDRITE	C	A/B		
LAR 06445	~	3.2	H5 CHONDRITE	C	A/B		
LAR 06446	~	15.0	LL6 CHONDRITE	B	B		
LAR 06447	~	17.0	L6 CHONDRITE	C	B		
LAR 06448	~	17.5	H6 CHONDRITE	C	B		
LAR 06460	~	90.1	H5 CHONDRITE	C	A		
LAR 06461	~	35.4	LL5 CHONDRITE	B	B		
LAR 06462	~	110.8	L5 CHONDRITE	C	C		
LAR 06463	~	188.7	L5 CHONDRITE	B	B		
LAR 06464	~	19.2	LL5 CHONDRITE	B	B		
LAR 06465	~	234.3	H4 CHONDRITE	C	A/B		
LAR 06466	~	247.6	L6 CHONDRITE	C	C		
LAR 06467	~	84.2	L6 CHONDRITE	B/C	B		
LAR 06468	~	30.8	L5 CHONDRITE	B	B		
LAR 06469		32.1	LL3 CHONDRITE	B	B	10-34	8-21

Sample Number		Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LAR 06540	~	26.7	H6 CHONDRITE	C	B		
LAR 06541	~	27.3	L6 CHONDRITE	C	B		
LAR 06543	~	11.8	L5 CHONDRITE	C	A/B		
LAR 06544	~	11.8	L6 CHONDRITE	C	A/B		
LAR 06545	~	17.1	H6 CHONDRITE	C	A/B		
LAR 06546	~	16.7	L5 CHONDRITE	C	A		
LAR 06547	~	13.4	L5 CHONDRITE	C	A/B		
LAR 06548	~	7.0	H5 CHONDRITE	C	A/B		
LAR 06549	~	19.3	H6 CHONDRITE	C	A/B		
LAR 06590	~	24.2	L5 CHONDRITE	C	B		
LAR 06591	~	15.2	H5 CHONDRITE	C	B		
LAR 06592	~	24.0	L5 CHONDRITE	C	B		
LAR 06593	~	25.7	L6 CHONDRITE	C	B		
LAR 06594	~	12.9	H5 CHONDRITE	C	B		
LAR 06595	~	22.2	L6 CHONDRITE	C	B		
LAR 06596	~	24.3	H6 CHONDRITE	C	B		
LAR 06597	~	17.4	L5 CHONDRITE	B	A/B		
LAR 06598	~	9.8	H5 CHONDRITE	C	B		
LAR 06599	~	11.0	H5 CHONDRITE	C	B		
LAR 06610	~	71.8	H5 CHONDRITE	C	C		
LAR 06611	~	193.2	L6 CHONDRITE	B/C	A		
LAR 06612	~	60.2	L5 CHONDRITE	C	B		
LAR 06613	~	132.3	L5 CHONDRITE	B	A		
LAR 06614	~	61.5	L4 CHONDRITE	C	B		
LAR 06615	~	128.0	L6 CHONDRITE	B	A		
LAR 06616	~	193.8	H5 CHONDRITE	C	A/B		
LAR 06617	~	73.9	L5 CHONDRITE	C	A/B		
LAR 06619	~	30.1	L5 CHONDRITE	C	A/B		
LAR 06620	~	24.0	H5 CHONDRITE	CE	A/B		
LAR 06622	~	23.6	H4 CHONDRITE	B/C	A		
LAR 06623	~	8.1	L6 CHONDRITE	C	B		
LAR 06624	~	8.1	H6 CHONDRITE	C	B		
LAR 06625	~	29.6	L5 CHONDRITE	B	B		
LAR 06627	~	21.1	H5 CHONDRITE	C	B		
LAR 06628		27.0	CV3 CHONDRITE	B/CE	A/B	0-3	0-1
LAR 06629	~	8.2	L6 CHONDRITE	C	B		
LAR 06630	~	15.4	H6 CHONDRITE	C	B		
LAR 06631	~	42.7	H5 CHONDRITE	C	A/B		
LAR 06632	~	19.9	H6 CHONDRITE	C	A/B		
LAR 06634	~	31.8	L5 CHONDRITE	CE	B		
LAR 06635	~	15.8	H5 CHONDRITE	C	A		
LAR 06637	~	19.0	H5 CHONDRITE	C	A/B		
LAR 06639	~	18.2	LL6 CHONDRITE	B	A/B		
LAR 06640	~	17.3	H5 CHONDRITE	C	A/B		
LAR 06641	~	12.2	H5 CHONDRITE	C	B		
LAR 06642	~	20.7	H5 CHONDRITE	C	A/B		
LAR 06643	~	18.9	L6 CHONDRITE	C	A/B		
LAR 06644	~	5.1	H6 CHONDRITE	CE	A/B		
LAR 06645	~	13.4	H6 CHONDRITE	C	A/B		
LAR 06646	~	17.4	H6 CHONDRITE	C	A/B		
LAR 06647	~	15.0	H6 CHONDRITE	C	A/B		
LAR 06649	~	6.7	H6 CHONDRITE	CE	A/B		
LAR 06650	~	38.1	H6 CHONDRITE	C	B		
LAR 06651	~	20.6	L6 CHONDRITE	C	A/B		
LAR 06652	~	19.9	H6 CHONDRITE	C	A/B		

Sample Number		Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LAR 06653	~	20.9	H6 CHONDRITE	C	A/B		
LAR 06655	~	12.9	H6 CHONDRITE	C	A/B		
LAR 06656	~	10.9	L6 CHONDRITE	B/C	B		
LAR 06657	~	17.1	H6 CHONDRITE	C	B		
LAR 06658	~	15.8	L6 CHONDRITE	C	A/B		
LAR 06660	~	111.4	H6 CHONDRITE	C	A/B		
LAR 06661	~	99.6	L5 CHONDRITE	B/C	B/C		
LAR 06662	~	50.6	L6 CHONDRITE	C	A/B		
LAR 06663	~	103.6	H6 CHONDRITE	C	A/B		
LAR 06664	~	94.8	LL6 CHONDRITE	B/C	B		
LAR 06665	~	96.3	H6 CHONDRITE	C	B		
LAR 06666	~	98.0	H6 CHONDRITE	C	B		
LAR 06667	~	52.6	L5 CHONDRITE	C	C		
LAR 06668	~	69.9	H5 CHONDRITE	C	B		
LAR 06669	~	78.0	H5 CHONDRITE	C	B		
LAR 06690	~	18.4	H5 CHONDRITE	C	A/B		
LAR 06692	~	10.9	H6 CHONDRITE	C	A/B		
LAR 06693	~	7.0	H5 CHONDRITE	C	A		
LAR 06694	~	11.3	H6 CHONDRITE	C	A/B		
LAR 06695	~	1.6	H5 CHONDRITE	C	A/B		
LAR 06696	~	10.4	H6 CHONDRITE	CE	A/B		
LAR 06697	~	4.1	H6 CHONDRITE	C	A/B		
LAR 06698	~	13.4	H6 CHONDRITE	C	A/B		
LAR 06699	~	24.9	H5 CHONDRITE	CE	A/B		
LAR 06700	~	13.8	L5 CHONDRITE	C	A/B		
LAR 06701	~	23.4	H6 CHONDRITE	C	B		
LAR 06702	~	18.3	H6 CHONDRITE	C	B		
LAR 06703	~	9.2	H5 CHONDRITE	C	B		
LAR 06704	~	6.1	H5 CHONDRITE	C	B		
LAR 06705	~	6.9	L6 CHONDRITE	C	A/B		
LAR 06706	~	23.9	L6 CHONDRITE	C	A/B		
LAR 06708	~	11.8	LL6 CHONDRITE	C	A/B		
LAR 06709	~	21.6	L5 CHONDRITE	B/C	B		
LAR 06710	~	19.0	H6 CHONDRITE	C	B		
LAR 06711	~	34.9	H6 CHONDRITE	C	B/C		
LAR 06712	~	19.6	H6 CHONDRITE	C	B/C		
LAR 06713	~	23.1	LL6 CHONDRITE	B	A/B		
LAR 06714	~	11.8	L4 CHONDRITE	B	A/B		
LAR 06715	~	7.7	L6 CHONDRITE	C	A		
LAR 06716	~	7.2	H5 CHONDRITE	C	A		
LAR 06717	~	29.2	H6 CHONDRITE	C	A/B		
LAR 06718	~	43.9	H6 CHONDRITE	C	C		
LAR 06719		15.3	UREILITE	B/CE	B/C	16-20	1-15
LAR 06730	~	14.7	L5 CHONDRITE	C	B		
LAR 06731	~	6.2	H6 CHONDRITE	C	A/B		
LAR 06732	~	24.6	L5 CHONDRITE	B/C	B		
LAR 06733	~	18.9	L5 CHONDRITE	C	A/B		
LAR 06735	~	14.1	H6 CHONDRITE	C	B		
LAR 06736	~	12.0	L6 CHONDRITE	C	A/B		
LAR 06737	~	7.3	L5 CHONDRITE	C	A/B		
LAR 06738	~	13.6	H6 CHONDRITE	C	B		
LAR 06739	~	11.9	H6 CHONDRITE	C	B		
LAR 06740	~	25.6	L5 CHONDRITE	C	A/B		
LAR 06741	~	10.4	L5 CHONDRITE	C	A/B		
LAR 06742	~	9.3	H6 CHONDRITE	C	A		

Sample Number		Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LAR 06743	~	5.7	L6 CHONDRITE	C	A		
LAR 06744	~	13.8	LL5 CHONDRITE	B	A/B		
LAR 06745	~	12.6	H6 CHONDRITE	C	A/B		
LAR 06746	~	7.8	L5 CHONDRITE	C	B		
LAR 06747	~	5.6	H6 CHONDRITE	C	A/B		
LAR 06748	~	13.0	H6 CHONDRITE	C	A/B		
LAR 06749	~	7.3	H6 CHONDRITE	C	B		
LAR 06760	~	21.9	L5 CHONDRITE	C	A		
LAR 06761	~	34.0	L5 CHONDRITE	C	A		
LAR 06762	~	32.3	L5 CHONDRITE	C	A/B		
LAR 06763	~	28.6	H6 CHONDRITE	C	A/B		
LAR 06764	~	22.6	H6 CHONDRITE	C	A/B		
LAR 06765	~	31.1	H6 CHONDRITE	C	A		
LAR 06766	~	12.3	L6 CHONDRITE	C	A/B		
LAR 06767	~	20.1	L5 CHONDRITE	B	B		
LAR 06768	~	31.3	H6 CHONDRITE	C	A/B		
LAR 06769	~	21.2	L6 CHONDRITE	C	A/B		
LAR 06770	~	32.4	LL6 CHONDRITE	B	B		
LAR 06771	~	23.4	L6 CHONDRITE	C	B		
LAR 06772		21.1	LL3 CHONDRITE	B	A/B	19-30	13-24
LAR 06773	~	16.2	H6 CHONDRITE	C	B		
LAR 06774		23.6	LL3 CHONDRITE	B	A/B	8-40	14-24
LAR 06775	~	27.7	L5 CHONDRITE	B/C	B		
LAR 06776	~	25.8	L5 CHONDRITE	C	B		
LAR 06777	~	17.3	H6 CHONDRITE	C	A/B		
LAR 06778	~	28.5	H6 CHONDRITE	C	B		
LAR 06779		12.9	LL5 CHONDRITE	C	B	28	23
LAR 06780	~	2.1	H6 CHONDRITE	C	B		
LAR 06781	~	8.2	L6 CHONDRITE	C	B		
LAR 06782	~	2.3	H6 CHONDRITE	C	A/B		
LAR 06783	~	5.2	H5 CHONDRITE	C	A/B		
LAR 06784	~	10.8	H6 CHONDRITE	C	A/B		
LAR 06785	~	6.3	H6 CHONDRITE	C	B		
LAR 06786	~	8.6	L6 CHONDRITE	C	B		
LAR 06787	~	8.4	H5 CHONDRITE	C	B		
LAR 06788	~	13.6	LL6 CHONDRITE	B/C	A/B		
LAR 06789	~	9.4	H6 CHONDRITE	C	A/B		
LAR 06790	~	18.7	L5 CHONDRITE	A/B	A		
LAR 06791	~	22.4	H6 CHONDRITE	C	A/B		
LAR 06792	~	12.6	L5 CHONDRITE	C	A/B		
LAR 06793	~	21.8	H6 CHONDRITE	C	A/B		
LAR 06794	~	13.4	H6 CHONDRITE	C	A/B		
LAR 06795	~	8.9	H6 CHONDRITE	C	B		
LAR 06796	~	8.2	H6 CHONDRITE	C	B		
LAR 06797	~	20.3	L5 CHONDRITE	C	A/B		
LAR 06798	~	15.1	H5 CHONDRITE	C	A/B		
LAR 06799	~	11.8	H6 CHONDRITE	C	A/B		
LAR 06830	~	12.3	H6 CHONDRITE	C	A/B		
LAR 06832	~	14.2	H6 CHONDRITE	C	A/B		
LAR 06833	~	19.1	H6 CHONDRITE	C	A/B		
LAR 06834	~	32.5	L5 CHONDRITE	B	A/B		
LAR 06835	~	2.3	L5 CHONDRITE	B/C	A/B		
LAR 06836	~	7.8	H6 CHONDRITE	CE	A/B		
LAR 06837	~	24.0	H6 CHONDRITE	CE	A/B		
LAR 06838	~	5.0	H6 CHONDRITE	C	A/B		

Sample Number		Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LAR 06839	~	14.2	L6 CHONDRITE	C	A/B		
LAR 06860	~	4.6	H5 CHONDRITE	C	B		
LAR 06861	~	8.0	H6 CHONDRITE	C	B		
LAR 06862	~	11.5	L5 CHONDRITE	B/C	B		
LAR 06863	~	7.8	H6 CHONDRITE	C	B		
LAR 06864	~	19.6	H6 CHONDRITE	C	B		
LAR 06865	~	20.2	L5 CHONDRITE	C	B		
LAR 06866	~	13.9	H6 CHONDRITE	C	B		
LAR 06881	~	2345.0	L6 CHONDRITE	B/C	A		
SCO 06010	~	1383.6	LL5 CHONDRITE	B	A		
SCO 06011	~	2072.0	L5 CHONDRITE	B/C	A		
SCO 06031	~	5.9	L5 CHONDRITE	B/C	A		
SCO 06032	~	16.1	L5 CHONDRITE	B/C	A		
SCO 06033	~	2.5	LL5 CHONDRITE	A/B	B		
SCO 06034	~	4.3	LL5 CHONDRITE	A/B	B		
SCO 06035	~	1.4	L5 CHONDRITE	C	BE		
SCO 06036	~	1.2	LL5 CHONDRITE	B	B		
SCO 06037	~	1.2	L5 CHONDRITE	B/C	B		
SCO 06038	~	0.4	LL5 CHONDRITE	B	B		
SCO 06039	~	40.5	LL5 CHONDRITE	A/B	B		
MIL 07001		924.2	DIOGENITE (OLIVINE)	A/B	A/B	28	23
MIL 07002		758.4	CV3 CHONDRITE	A/BE	B/C	0-7	1
MIL 07003		291.9	DIOGENITE	B	A/B		27-34
MIL 07004		703.2	EUCRITE (BRECCIATED)	B	B		27-62
MIL 07005		75.0	LL6 CHONDRITE	A/BE	A/B	30	25
MIL 07006		1.4	LUNAR-BASALTIC BRECCIA	B	A/B	41-52	28-53
MIL 07007		29.4	HOWARDITE	A/B	A/B	10-12	21-61
MIL 07008		31.9	AUBRITE	B	A/B		0
MIL 07009		12.3	HOWARDITE	A/B	A/B	0	25-60
MIL 07010		1528.8	L CHONDRITE (IMPT MELT)	B/C	B/C	24	20
MIL 07108	~	114.7	H6 CHONDRITE	B/C	A		
MIL 07114	~	139.4	LL5 CHONDRITE	A/B	A/B		
MIL 07119		232.9	IRON-IVA	A/B	A/B		
MIL 07147	~	97.3	LL5 CHONDRITE	A/B	A/B		
MIL 07448		42.4	IRON-IAB-IIICD	A/B	A		
MIL 07662		51.4	EUCRITE (BRECCIATED)	B/C	B		45-54
MIL 07666		96.3	IRON-IIAB	A/B	A		
MIL 07667		60.8	IRON (UNGROUPED)	A/B	A/B		
MIL 07673		27.2	CO3 CHONDRITE	BE	A	1-62	1-8
MIL 07676		32.2	CM2 CHONDRITE	AE	A	0-36	4
MIL 07679		17.3	CM2 CHONDRITE	AE	A	0-18	1
MIL 07700		67.6	CM2 CHONDRITE	A	A/B	1-30	
MIL 07704	~	24.9	L6 CHONDRITE	B	A		
MIL 07705		134.8	LL6 CHONDRITE	A/B	A/B	30	24
MIL 07706	~	373.8	LL6 CHONDRITE	A/B	A		
MIL 07707	~	237.1	L5 CHONDRITE	B/C	A		
MIL 07708		26.3	CM2 CHONDRITE	A/BE	B	0-46	
MIL 07709		77.2	CO3 CHONDRITE	B	A	1-29	1-3

Table 2

Newly Classified Specimens Listed By Type

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
Achondrites						
MIL 07008	31.9	AUBRITE	B	A/B		0
MIL 07003	291.9	DIOGENITE	B	A/B		27-34
MIL 07001	924.2	DIOGENITE (OLIVINE)	A/B	A/B	28	23
MIL 07004	703.2	EUCRITE (BRECCIATED)	B	B		27-62
MIL 07662	51.4	EUCRITE (BRECCIATED)	B/C	B		45-54
MIL 07007	29.4	HOWARDITE	A/B	A/B	10-12	21-61
MIL 07009	12.3	HOWARDITE	A/B	A/B	0	25-60
MIL 07006	1.4	LUNAR-BASALTIC BRECCIA	B	A/B	41-52	28-53
LAR 06719	15.3	UREILITE	B/CE	B/C	16-20	1-15
Carbonaceous Chondrites						
MIL 07676	32.2	CM2 CHONDRITE	AE	A	0-36	4
MIL 07679	17.3	CM2 CHONDRITE	AE	A	0-18	1
MIL 07700	67.6	CM2 CHONDRITE	A	A/B	1-30	
MIL 07708	26.3	CM2 CHONDRITE	A/BE	B	0-46	
MIL 07673	27.2	CO3 CHONDRITE	BE	A	1-62	1-8
MIL 07709	77.2	CO3 CHONDRITE	B	A	1-29	1-3
LAR 06628	27.0	CV3 CHONDRITE	B/CE	A/B	0-3	0-1
MIL 07002	758.4	CV3 CHONDRITE	A/BE	B/C	0-7	1
Chondrites - Type 3						
LAR 06343	18.5	LL3 CHONDRITE	B/C	B	11-31	15-23
LAR 06469	32.1	LL3 CHONDRITE	B	B	10-34	8-21
LAR 06772	21.1	LL3 CHONDRITE	B	A/B	19-30	13-24
LAR 06774	23.6	LL3 CHONDRITE	B	A/B	8-40	14-24
Irons						
MIL 07448	42.4	IRON-IAB-IIICD	A/B	A		
MIL 07666	96.3	IRON-IIAB	A/B	A		
MIL 07119	232.9	IRON-IVA	A/B	A/B		
MIL 07667	60.8	IRON-UNGROUPED	A/B	A/B		

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
		L and LL Chondrites				
MIL 07010	1528.8	L CHONDRITE (IMPT MELT)	B/C	B/C	24	20
LAR 06298	2208.5	LL CHONDRITE (IMPT MELT)	B	A/B	29	23
LAR 06299	751.9	LL CHONDRITE (IMPT MELT)	B	A/B	29	23

**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.

The ~ indicates classification by optical methods. This can include macroscopic assignment to one of several well-characterized, large pairing groups (e.g., the QUE LL5 chondrites), as well as classification based on oil immersion of several olivine grains to determine the approximate index of refraction for grouping into H, L or LL chondrites. Petrologic types in this method are determined by the distinctiveness of chondrules boundaries on broken surfaces of a 1-3 g chip. While this technique is suitable for general characterization and delineation of equilibrated ordinary chondrites, those undertaking detailed study of any meteorite classified by optical methods alone should use caution. It is recommended that a polished thin section be requested to accompany any chip and appropriate steps for a more detailed characterization should be undertaken by the user. (Tim McCoy, Smithsonian Institution)

Table 3

Tentative Pairings for New Meteorites

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 Bulletins No. 76 (Meteoritics 29, 100-143), No. 79 (Meteoritics and Planetary Science 31, A161-174), No. 82 (Meteoritics and Planetary Science 33, A221-A239), No. 83 (Meteoritics and Planetary Science 34, A169-A186), No. 84 (Meteoritics and Planetary Science 35, A199-A225), No. 85 (Meteoritics and Planetary Science 36, A293-A322), No. 86 (Meteoritics and Planetary Science 37, A157-A184), No. 87 (Meteoritics and Planetary Science 38, A189-A248), No. 88 (Meteoritics and Planetary Science 39, A215-272), No. 89 (Meteoritics and Planetary Science 40, A201-A263), No. 90 (Meteoritics and Planetary Science 41, 1383-1418), No. 91 (Meteoritics and Planetary Science, 42, 413-466), No. 92 (Meteoritics and Planetary Science 42, 1647-1692), No. 93 (Meteoritics and Planetary Science 43, 571-632) and No. 94 (Meteoritics and Planetary Science 43, in press).

CM2 CHONDRITE
MIL 07679 and MIL 07708 with MIL 07676

CO3 CHONDRITE
MIL 07709 with MIL 07673

LL CHONDRITE (Impact Melt)
LAR 06299 with LAR 06298

LL3 CHONDRITE
LAR 06469, LAR 06772 and LAR 06774 with LAR 06343

Petrographic Descriptions

Sample Number:	LAR 06298, LAR 06299
Location:	Larkman Nunatak
Field Number:	19687, 19691
Dimensions (cm):	14.0 x 10.0 x 7.0; 9.0 x 7.0 x 6.0
Weight (g):	2208.5; 751.922
Classification:	LL Chondrite (Impact Melt)

Macroscopic Description: Kathleen McBride

The exteriors of these meteorites are rough, blackish in color with a few oxidation halos. There are some smooth areas that are lighter or more grayish in color than the rougher areas. Very small patches of rough, black fusion crust are present. The interiors are dark gray matrix with vesicles.

Thin Section (,2) Description: Tim McCoy and Linda Welzenbach

The sections are so similar that a single description suffices. They consist of a matrix of individual mineral fragments up to 100 microns in a melt-textured matrix with rounded to ellipsoidal metal-sulfide blebs. LAR 06298 also exhibits larger (up to several mm) unmelted chondritic fragments with rare relict barred olivine chondrules. Olivine is Fa_{29}, pyroxene is Fs_{23}. The meteorites are LL chondrite impact melt breccias.

Sample Number:	LAR 06343, LAR 06469, LAR 06772, LAR 06774
Location:	Larkman Nunatak
Field Number:	19052, 19389, 19936, 19990
Dimensions (cm):	3.0 x 2.25 x 1.5; 2.5 x 3.5 x 3.0; 2.5 x 1.5 x 1.75; 3.0 x 2.5 x 1.5
Weight (g):	18.498; 32.079; 21.063; 23.550
Classification:	LL3 Chondrite

Macroscopic Description: Kathleen McBride

The exteriors of these paired meteorites are covered with brown/black smooth fusion crust. The interiors are a rusty black to gray color with high metal content and chondrules of various sizes and colors.

Thin Section (,2) Description: Tim McCoy and Cari Corrigan

The sections exhibit numerous large (up to 2 mm), well-defined chondrules in a dark matrix of fine-grained silicates, metal and troilite. Polysynthetically twinned pyroxene is abundant. The meteorites are lightly weathered. Silicates are unequilibrated; olivines range from Fa_{8-40}, with a large peak at Fa_{28-30}, and pyroxenes from Fs_{14-24}. The meteorites are LL3 chondrites, probably of subtype ~3.8.

Sample Number:	LAR 06628
Location:	Larkman Nunatak
Field Number:	19309
Dimensions (cm):	3.75 x 3.0 x 2.75
Weight (g):	27.040
Classification:	CV3 Chondrite

Macroscopic Description: Kathleen McBride

10% of the exterior of this carbonaceous chondrite has vesicular black fusion crust with polygonal fractures. The interior is black with evaporites and an oxidation rind. Millimeter sized gray chondrules are visible.

Thin Section (,3) Description: Tim McCoy and Linda Welzenbach

The section exhibits chondrules (up to 1 mm) and CAIs in a dark matrix. Olivines range from Fa_{0-3} and pyroxenes from Fs_{0-1}. The meteorite is an unequilibrated carbonaceous chondrite, probably a CV3.

Sample Number: LAR 06719
Location: Larkman Nunatak
Field Number: 19754
Dimensions (cm): 2.5 x 2.0 x 1.5
Weight (g): 15.272
Classification: Ureilite

Macroscopic Description: Kathleen McBride
40% of this achondrite's exterior is covered with vesicular black fusion crust with polygonal fractures. The interior is a rusty matrix with clear and dark glassy inclusions. The meteorite is friable and has evaporites.

Thin Section (,6) Description: Tim McCoy and Linda Welzenbach
The section consists of an aggregate of large olivine and pyroxene grains up to 2 mm across. Individual olivine grains are rimmed by carbon-rich material containing traces of metal. Olivine is Fa_{16-20} and pigeonite is $Fs_{1-15}Wo_{3-9}$. The meteorite is a ureilite.

Sample Number: MIL 07001
Location: Miller Range
Field Number: 19101
Dimensions (cm): 11.0 x 9.0 x 8.5
Weight (g): 924.2
Classification: Diogenite (Olivine)

Macroscopic Description: Roger Harrington
Dull black fusion crust covers 40% of this achondrite's exterior. Approximately 40% of the exterior is a tan to medium olive green with a fine grained matrix. 20% is medium to light olive green with a coarse grained matrix. One 3 mm diameter dark mineral inclusion is present on the top north side. Cleavage planes are visible on the inclusion when viewed under a hand lens. The interior is a medium gray to orange tan fine grained matrix with less than 1% small (<1 mm) dark mineral inclusions.

Thin Section (,7) Description: Tim McCoy and Linda Welzenbach
The section is unbrecciated and is dominated by 0.5-1 mm equigranular orthopyroxene with abundant 120º triple junctions. Olivine occurs as rounded grains both interstitially to and poikilitically enclosed in the orthopyroxene. Opaques included oxides, troilite and metal. Orthopyroxene has a composition of $Fs_{23}Wo_2$ and olivine is Fa_{28}. The Fe/Mn ratio of the pyroxene is ~30. The meteorite is an olivine diogenite.

Oxygen isotopic analysis: Z. Sharp, University of New Mexico
Oxygen isotopic analyses of two splits yielded the following results which fall in the HED meteorite field. All samples were cleaned in a 10% HCl solution for 1 minute followed by ultrasonication.

$\delta^{17}O = 1.64$, $\delta^{18}O = 3.80$, $\Delta^{17}O = -0.33$
$\delta^{17}O = 1.34$, $\delta^{18}O = 3.55$, $\Delta^{17}O = -0.50$
[where $\Delta^{17}O = \delta^{17}O - 0.52 \times \delta^{18}O$]

Sample Number: MIL 07002
Location: Miller Range
Field Number: 18651
Dimensions (cm): 11.0 x 9.5 x 7.5
Weight (g): 758.387
Classification: CV3 Chondrite

Macroscopic Description: Roger Harrington
Dull black fusion crust covers 15% of the exterior surface. 85% of the exterior is a dark greenish gray fine-grained matrix with approximately 15% light to medium gray inclusions distributed evenly across the surface of the sample. The interior is a medium gray fine grained matrix with light gray inclusions and trace amounts of evaporite material around exposed cracks.

Thin Section (,6) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne
The section exhibits large chondrules (up to 3 mm) and CAIs in a dark matrix. Olivines range from Fa_{0-7} and pyroxene is Fs_1. The meteorite is an unequilibrated carbonaceous chondrite, probably a CV3.

Sample Number:	MIL 07003	
Location:	Miller Range	
Field Number:	17561	
Dimensions (cm):	8.0 x 4.5 x 5.0	
Weight (g):	291.948	
Classification:	Diogenite	

Macroscopic Description: Kathleen McBride

50% of the exterior is covered by dark brown black fusion crust with polygonal fractures. The exposed interior is tan and fractured. The tan interior with yellowish brown patches mar the surface. Black, glassy veins and inclusions and a few white clasts are present.

Thin Section (,4) Description: Tim McCoy and Linda Welzenbach

The section shows a groundmass of coarse (up to 2 mm) comminuted pyroxene with interstitial plagioclase and SiO_2. Orthopyroxene has a composition of $Fs_{27-34}Wo_{1-4}$ and plagioclase is $An_{85-89}Or_1$. The Fe/Mn ratio of the pyroxene is ~30. The meteorite is a diogenite, although the pyroxene is on the FeO-rich end of diogenites towards cumulate eucrites.

Oxygen isotopic analysis: Z. Sharp, University of New Mexico

Oxygen isotopic analyses of two splits yielded the following results which fall in the HED meteorite field. All samples were cleaned in a 10% HCl solution for 1 minute followed by ultrasonication.

$\delta^{17}O = 1.57$, $\delta^{18}O = 3.57$, $\Delta^{17}O = -0.29$
$\delta^{17}O = 1.48$, $\delta^{18}O = 3.66$, $\Delta^{17}O = -0.42$
[where $\Delta^{17}O = \delta^{17}O - 0.52 \times \delta^{18}O$]

Sample Number:	MIL 07004	
Location:	Miller Range	
Field Number:	17958	
Dimensions (cm):	10.5 x 6.0 x 6.0	
Weight (g):	703.223	
Classification:	Eucrite (Brecciated)	

Macroscopic Description: Kathleen McBride

75% of the exterior is covered with black shiny, ropey fusion crust. The exposed interior is gray with numerous vugs. Some areas of fusion crust exhibit polygonal fracturing. The interior consists of tan clasts of various sizes surrounded by light gray matrix. Some areas have white material (evaporites). The fine grained matrix is soft and moderately friable.

Thin Section (,6) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

This meteorite is dominated by fine-grained (~200 micron average grain size) basaltic clasts set in a clastic matrix. Mineral compositions are homogeneous with orthopyroxene ($Fs_{62}Wo_2$), with lamellae of augite ($Fs_{27}Wo_{43}$), and plagioclase ($An_{88}Or_{0.4}$). The Fe/Mn ratio of the pyroxene is ~30. The meteorite is a brecciated eucrite.

Sample Number:	MIL 07006	
Location:	Miller Range	
Field Number:	17961	
Dimensions (cm):	1.5 x 1.0 x 0.75	
Weight (g):	1.368	
Classification:	Lunar Basaltic Breccia	

Macroscopic Description: Kathleen McBride

The exterior has no fusion crust and consists of a black matrix with visible clasts. The interior is a black matrix with gray, tan and white clasts.

Thin Section (,3) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

The section shows a groundmass of comminuted pyroxene and plagioclase (up to 0.5 mm) with fine- to coarse-grained basaltic clasts ranging up to 2.5 mm. The matrix is extremely fine-grained and shock-darkened and melted in places. The pyroxene compositions range from $Fs_{53}Wo_7$ to $Fs_{28}Wo_{41}$ with a range of intermediate compositions. Plagioclase is An_{96}. Olivine is Fa_{41-52}. This meteorite is a basaltic lunar breccia, probably a regolith breccia. Fe/Mn ratio is 38-57.

Sample Number: MIL 07007
Location: Miller Range
Field Number: 18637
Dimensions (cm): 4.0 x 2.0 x 3.0
Weight (g): 29.38
Classification: Howardite

Macroscopic Description: Kathleen McBride

The exterior has 40% dark brown to black fusion crust with polygonal fractures. Interior that is exposed is tan with numerous inclusions of various shapes, sizes and colors. The interior is a light gray matrix with cream colored inclusions <3 mm in size, tiny black specks and a couple of rusty places.

Thin Section (,4) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan, and Rhiannon Mayne

The section shows a groundmass of comminuted pyroxene and plagioclase (up to 1 mm) with fine- to coarse-grained basaltic clasts ranging up to 1 mm. There appear to be a number of impact melt fragments. Orthopyroxene ranges from $Fs_{21-61}Wo_{1-4}$ (most Fs_{20-30}), and augite ranges up to $Fs_{21}Wo_{41}$ and olivine of Fa_{10-12}. The meteorite is a howardite.

Sample Number: MIL 07008
Location: Miller Range
Field Number: 19982
Dimensions (cm): 3.5 x 3.0 x 1.5
Weight (g): 31.869
Classification: Aubrite

Macroscopic Description: Kathleen McBride

The exterior has no fusion crust. It has a black basaltic looking matrix with white to light gray clasts. There are a couple of areas where there is some off white material. The interior is the same as the exterior.

Thin Section (,6) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan, and Rhiannon Mayne

The section consists of a few large FeO-free enstatite grains (up to nearly 1 cm) set in a brecciated matrix that includes FeO-free diopsides up to ~200 microns. Shock-induced planar deformation features, mosaicism, and shock darkening are common as are shock melts in the matrix. Opaques include alabandite, troilite, metal, and an unidentified Cr-Ti sulfide, possibly brezinaite. The meteorite is an aubrite.

Sample Number: MIL 07009
Location: Miller Range
Field Number: 18625
Dimensions (cm): 2.5 x 1.5 x 1.5
Weight (g): 12.254
Classification: Howardite

Macroscopic Description: Kathleen McBride

99% of the exterior is covered with shiny black fusion crust. Oxidation halos are visible on one side. The interior is a light gray matrix with tiny white and black inclusions (<mm). Some lighter gray angular inclusions are also present (<2 mm).

Thin Section (,4) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

The section shows a groundmass of comminuted pyroxene and plagioclase (up to 0.5 mm) with fine- to coarse-grained basaltic clasts ranging up to 5 mm. A few large, but highly weathered, metal and sulfide particles are present. Pyroxene compositions range from $Fs_{25-60}Wo_{4-44}$. Plagioclase composition is An_{84-89}. The meteorite is probably a howardite, although the large metal-sulfide particles could suggest an origin as a silicate clast from a mesosiderite.

Sample Number:	MIL 07010
Location:	Miller Range
Field Number:	14261
Dimensions (cm):	10.0 x 7.0 x 7.5
Weight (g):	1528.76
Classification:	L Chondrite (Impact Melt)

Macroscopic Description: Kathleen McBride

The dark, rusty gray exterior of this meteorite has no fusion crust and has a smooth, fractured surface with tiny pits. The interior is rusty.

Thin Section (,4) Description: Tim McCoy and Linda Welzenbach

The section consists of a matrix of individual mineral fragments up to 100 microns in a melt-textured matrix with rounded to ellipsoidal metal-sulfide blebs. Olivine is Fa_{24}, pyroxene is Fs_{20}. The meteorite is an L chondrite impact melt breccia.

Sample Number:	MIL 07119
Location:	Miller Range
Field Number:	17378
Dimensions (cm):	5.8 x 4.5 x 8.0
Weight (g):	232.934
Classification:	Iron (IVA)

Macroscopic Description: Cari Corrigan and Linda Welzenbach

This kidney-shaped meteorite has a very smooth exterior surface partially (30%) covered by fusion crust with little oxidation. One prominent fracture cuts across the long axis of the sample and extends to the interior. One end, which is saddle-shaped, shows minor flow bands.

Microscopic Description: Tim McCoy, Cari Corrigan and Linda Welzenbach

The meteorite was examined from a cut and etched surface, which bisected the smaller end or nose of the specimen. The surface exhibits prominent kamacite lamellae with bandwidths less than 0.3 mm set in approximately 30-40% plessite fields. The meteorite exhibits α_2 structure throughout. Fusion crust is preserved over a portion of the thin section and reaches a width of ~100 microns. A line scan across the meteorite suggests a composition of 8.0 wt.% Ni and 0.09 wt.% P. The meteorite is an iron. The composition might suggest IIIAB, although it is similar to IVA irons and the bandwidth is typical of IVA irons. Given these facts, we suggest a preliminary classification as group IVA.

Sample Number:	MIL 07448
Location:	Miller Range
Field Number:	18646
Dimensions (cm):	2.1 x 2.0 x 2.0
Weight (g):	42.441
Classification:	Iron (IAB-IIICD)

Macroscopic Description: Cari Corrigan and Linda Welzenbach

This roughly spherical meteorite is heavily pitted with one end appearing to be broken. The exterior surface has a prominent fusion crust with rust halos associated with pitting. Some pits have a distinctive linear aspect that suggests a Widmanstätten structure.

Microscopic Description: Tim McCoy, Cari Corrigan and Linda Welzenbach

The meteorite was examined from a cut and etched surface, which bisects the specimen. The meteorite appears to have been heavily shocked and exhibits α_2 structure throughout, with abundant Neumann bands and little Widmanstätten pattern preserved. A heat altered zone ~800 microns thick underlies a small amount of highly weathered fusion crust. The meteorite is polycrystalline with large kamacite grains up to 2 mm wide (L/W ~5) separated by thin ribbons of zoned taenite which reach up to 100 microns in width and which have been preferentially weathered producing veins of hydrated iron oxides cross-cutting the specimen. Scattered pockets of graphite, in many cases mixed with hydrated iron oxides of terrestrial origin, are found throughout the meteorite. A line scan across the meteorite suggests a composition of 7.0 wt.% Ni and 0.2 wt.% P. The meteorite is an iron. The composition and bandwidth suggest a tentative classification of IAB-IIICD.

Sample Number: MIL 07662
Location: Miller Range
Field Number: 18352
Dimensions (cm): 4.5 x 5.0 x 2.0
Weight (g): 51.362
Classification: Eucrite (Brecciated)

Macroscopic Description: Kathleen McBride

Black fusion crust that is shiny and ropey covers 15% of the exterior. Areas without fusion crust are a dirty gray color with large pinkish area and black and white inclusions. The interior looks the same as the exterior minus the fusion crust.

Thin Section (,5) Description: Tim McCoy and Linda Welzenbach

The section is a breccia with mono- and polymineralic clasts of pyroxene and plagioclase up to 1 mm in diameter in a fine-grained melt-textured matrix which is coarser-grained on one half of the section and cryptocrystalline on the other half. Pyroxene is finely exsolved, yielding pigeonitic compositions of $Fs_{45-54}Wo_{5-15}$ and plagioclase is $An_{86-93}Or_{0-1}$. The Fe/Mn ratio of the pyroxene is ~28. The meteorite is a eucritic impact melt breccia.

Oxygen isotopic analysis: Z. Sharp, University of New Mexico

Oxygen isotopic analyses of two splits yielded the following results which fall in the HED meteorite field. All samples were cleaned in a 10% HCl solution for 1 minute, followed by ultrasonication.

$\delta^{17}O = 1.68$, $\delta^{18}O = 3.86$, $\Delta^{17}O = -0.33$
$\delta^{17}O = 1.59$, $\delta^{18}O = 3.70$, $\Delta^{17}O = -0.34$
$\delta^{17}O = 1.64$, $\delta^{18}O = 3.89$, $\Delta^{17}O = -0.38$
[where $\Delta^{17}O = \delta^{17}O - 0.52 \times \delta^{18}O$]

Sample Number: MIL 07666
Location: Miller Range
Field Number: 18159
Dimensions (cm): 5.0 x 2.9 x 1.4
Weight (g): 96.250
Classification: Iron (IIAB)

Macroscopic Description: Cari Corrigan and Linda Welzenbach

This lozenge-shaped meteorite is flight oriented with a slight melt flange on the top side. The bottom or flight surface is finely pitted, the top side smoother but with sporadic, deeper regmaglypts. Fusion crust is 100% and exhibits mild oxidation in the form of iridescence and minor halos.

Microscopic Description: Tim McCoy, Cari Corrigan and Linda Welzenbach

The meteorite was examined from a cut and etched surface, which bisected one end or nose of the specimen. A thin fusion crust is preserved over most of the meteorite, and gradational heat alteration zone of approximately 1.0-2 mm thick underlies the fusion crust on the bottom or flight side, and is less than 0.3 mm thick on the top side. A prominent coarse α_2 structure is found throughout. The section exhibits subequant grains ranging up to 1 mm in size which meet at 120° triple junctions throughout. The grains often exhibit subgrain boundaries with subgrains of 100-200 microns decorated by taenite precipitates. One prominent fracture with iron oxides cross cuts the specimen following grain boundaries. Equant schreibersites up to ~300 microns are observed. A line scan across the meteorite suggests a composition of 5.4 wt.% Ni and 0.3 wt.% P. The meteorite is an iron. The composition suggests a tentative classification of IIAB.

Sample Number: MIL 07667
Location: Miller Range
Field Number: 18613
Dimensions (cm): 4.5 x 3.0 x 1.2
Weight (g): 60.835
Classification: Iron (Ungrouped)

Macroscopic Description: Cari Corrigan and Linda Welzenbach

This amoeboid-shaped meteorite is finely pitted over the entire surface. Fine flow lines are visible along prominent edges. Fusion crust is 80-90% and exhibits mild oxidation in the form of iridescence and minor halos. Fractures occur in several places over the surface and cross cut some of the lobes.

Microscopic Description: Tim McCoy, Cari Corrigan and Linda Welzenbach

The meteorite was examined from a cut and etched surface, which bisected one of the three distinct lobes of the specimen. Fusion crust reaching up to 0.4 mm in thickness is preserved over half the meteorite and a prominent fine α_2 structure is present throughout. Short kamacite lamellae exceed 2 mm in width and are separated by thin (~100 micron wide) ribbons of taenite, which are often replaced by hydrated iron oxides of terrestrial origin. Many of the kamacite grains exhibit subgrains of a few hundred microns in size. Also present are ellipsoidal melt pockets with dendritic intergrowths of metallic and phosphorus-rich melt. A line scan across the meteorite suggests a composition of 6.6 wt.% Ni and 0.1 wt.% P. The meteorite is an iron. We tentatively classify it as ungrouped, recognizing that the section is so small and the structure so coarse that it is likely not representative of the larger mass from which it was derived. Of the known major groups, it is most similar to IAB, although at the extreme low-Ni, low-P composition for this group.

Sample Number: MIL 07673; MIL 07709
Location: Miller Range
Field Number: 17529, 17989
Dimensions (cm): 3.5 x 2.5 x 2.0; 5.0 x 4.0 x 2.3
Weight (g): 27.19; 77.22
Classification: CO3 Chondrites

Macroscopic Description: Kathleen McBride

The exterior is covered with brown/black shiny fusion crust with pits, evaporites and oxidation haloes. The interiors consist of a gray and black matrix with tiny light inclusions.

Thin Section Description (,8,3): Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

These sections are so similar that a single description suffices. The sections consist of abundant small (up to 1 mm) chondrules, chondrule fragments and mineral grains in a dark matrix. Metal and sulfide occur within and rimming the chondrules. Olivine ranges in composition from Fa_{1-62}, with a continuous range of intermediate compositions and a slight peak at Fa_{20-40}. Two pyroxene analyses range from $Fs_{1-8}Wo_{2-4}$. The meteorites are CO3 chondrites.

Sample Number: MIL 07676; MIL 07679; MIL 07708
Location: Miller Range
Field Number: 19515, 18147, 17596
Dimensions (cm): 4.5 x 3.0 x 2.5; 3.0 x 2.5 x 2.0; 3.0 x 2.5 x 2.5
Weight (g): 32.175; 17.349; 26.378
Classification: CM2 Chondrite

Macroscopic Description: Roger Harrington

The fusion crust on these paired meteorites ranges from dull black to none present. Those lacking fusion crust have a dull black exterior. The fine grained black matrix has very small (<1 mm) tan inclusions. There is a trace amount of white evaporite material visible in two of the meteorites.

Thin Section (,6) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

These sections are so similar that a single description suffices. The sections consist of a few small chondrules (up to 0.5 mm), mineral grains and CAIs set in a black matrix; rare metal and sulfide grains are present. Olivine compositions are Fa_{0-46}, orthopyroxene is Fs_4. The meteorites are CM2 chondrites.

Sample Number:	MIL 07700	
Location:	Miller Range	
Field Number:	17597	
Dimensions (cm):	6.0 x 5.0 x 2.5	
Weight (g):	67.629	
Classification:	CM2 Chondrite	

Macroscopic Description: Roger Harrington

The exterior has a dull black fusion crust on 90% of its surface. There is a broken surface that reveals a black fine grained matrix with metal inclusions that are bounded by a white mineral. The interior is a dull black fine-grained matrix.

Thin Section (,6) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

This section consist of a few small chondrules (up to 0.5 mm), mineral grains and CAIs set in a black matrix; rare metal and sulfide grains are present. Chondrules have experienced modest aqueous alteration. Olivine compositions are Fa_{1-30}. The meteorite is a CM2 chondrite.

Sample Number:	MIL 07705	
Location:	Miller Range	
Field Number:	17975	
Dimensions (cm):	6.0 x 5.5 x 4.5	
Weight (g):	134.831	
Classification:	LL6 Chondrite	

Macroscopic Description: Marc Fries and Cecilia Satterwhite

60% of the exterior has a dull black fusion crust. There is some minor rust on one surface and fine grained matrix is visible in areas without fusion crust. The interior is a fine grained gray matrix with melt veins and some lighter colored mm sized clasts. Metal grains/sulfides and minor rust are visible.

Thin Section (,6) Description: Tim McCoy, Linda Welzenbach, Cari Corrigan and Rhiannon Mayne

The meteorite is an LL6 chondrite (Fa_{30}, Fs_{24}) which has a network of shock melt veins, one of which traverses the entire section, reaches a width of 1.5 mm and is composed entirely of iron sulfide, presumably troilite.

Sample Request Guidelines

The Meteorite Working Group (MWG), is 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. The deadline for submitting a request is 2 weeks prior to the scheduled meeting.

Requests that are received by the MWG secretary by **September 17, 2008 deadline** will be reviewed at the MWG meeting **September 29-30, 2008 in Arlington, VA**. Requests that are received after the deadline may be delayed for review until MWG meets again in the Spring of 2009. Please submit your requests on time. Questions pertaining to sample requests can be directed to the MWG secretary by e-mail, fax or phone.

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 have a supervising scientist listed to confirm access to facilities for analysis. All sample requests will be reviewed in a timely manner. Sample requests that do not meet the curatorial allocation guidelines will be reviewed by the Meteorite Working Group (MWG). 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 an appropriate funding agency. As a matter of policy, U.S. Antarctic meteorites are the property of the National Science Foundation, and all allocations are subject to recall.

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 Contributions to the Earth Sciences*: Nos. 23, 24, 26, 28, and 30. Tables containing all classified meteorites (as of August 2006 have been published in the Meteoritical Bulletins 76, 79, and 82-90 available in the following volumes and pages of *Meteoritics* and *Meteoritics and Planetary Science*: 29, p. 100-143; 31, A161-A174; 33, A221-A240; 34, A169-A186; 35, A199-A225; 36, A293-A322; 37, A157-A184; 38, A189-A248; 39, A215-A272; 40, A201-263; 41,1383-1418; 42, 1647-1692; 43, 571-632, and No. 94, 43 in press. They are also available online at:

http://www.meteoriticalsociety.org/simple_template.cfm?code=pub_bulletin

The most current listing is found online at:

http://curator.jsc.nasa.gov/curator/antmet/us_clctn.htm

All sample requests should be made electronically using the form at:

http://curator.jsc.nasa.gov/curator/antmet/samreq.htm

The purpose of the sample request form is to obtain all information MWG needs prior to their deliberations to make an informed decision on the request. Please use this form if possible.

The preferred method of request transmittal is via e-mail. Please send requests and attachments to:

cecilia.e.satterwhite@nasa.gov

Type **MWG Request** in the e-mail subject line. Please note that the form has signature blocks. The signature blocks should only be used if the form is sent via Fax or mail.

Each request should accurately refer to meteorite samples by their respective identification numbers and should provide detailed scientific justification for proposed research. Specific requirements for samples, such as sizes or weights, particular locations (if applicable) within individual specimens, or special handling or shipping procedures should be explained in each request. Some meteorites are small, of rare type, or are considered special because of unusual properties. Therefore, it is very important that all requests specify both the optimum amount of material needed for the study and the minimum amount of material that can be used. Requests for thin sections that will be used in destructive procedures such as ion probe, laser ablation, etch, or repolishing must be stated explicitly.

Consortium requests should list the members in the consortium. All necessary information should be typed on the electronic form, although informative attachments (reprints of publication that explain rationale, flow diagrams for analyses, etc.) are welcome.

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Meteorites On-Line

Several meteorite web site are available to provide information on meteorites from Antarctica and elsewhere in the world. Some specialize in information on martian meteorites and on possible life on Mars. Here is a general listing of ones we have found. We have not included sites focused on selling meteorites even though some of them have general information. Please contribute information on other sites so we can update the list.

JSC Curator, Antarctic meteorites	http://www-curator.jsc.nasa.gov/antmet/index.cfm
JSC Curator, Lunar Meteorite Compendium	http://www-curator.jsc.nasa.gov/antmet/lmc/index.cfm
JSC Curator, martian meteorites	http://www-curator.jsc.nasa.gov/antmet/marsmets/index.cfm
JSC Curator, Mars Meteorite Compendium	http://www-curator.jsc.nasa.gov/antmet/mmc/index.cfm
Antarctic collection	http://geology.cwru.edu/~ansmet/
Smithsonian Institution	http://www.minerals.si.edu/
LPI martian meteorites	http://www.lpi.usra.edu
NIPR Antarctic meteorites	http://www.nipr.ac.jp/
Museo Nazionale dell'Antartide	http://www.mna.it/english/Collections/collezioni_set.htm
BMNH general meteorites	http://www.nhm.ac.uk/research-curation/departments/mineralogy/research-groups/meteoritics/index.html
UHI planetary science discoveries	http://www.psrd.hawaii.edu/index.html
Meteoritical Society	http://www.meteoriticalsociety.org/
Meteoritics and Planetary Science	http://meteoritics.org/
Meteorite! Magazine	http://meteoritemag.uark.edu
Geochemical Society	http://www.geochemsoc.org
Washington Univ. Lunar Meteorite	http://epsc.wustl.edu/admin/resources/moon_meteorites.html
Washington Univ. "meteor-wrong"	http://epsc.wustl.edu/admin/resources/meteorites/meteorwrongs/meteorwrongs.htm

Other Websites of Interest

Mars Exploration	http://mars.jpl.nasa.gov
Rovers	http://marsrovers.jpl.nasa.gov/home/index.html
Near Earth Asteroid Rendezvous	http://near.jhuapl.edu/
Stardust Mission	http://stardust.jpl.nasa.gov
Genesis Mission	http://genesismission.jpl.nasa.gov
ARES	http://ares.jsc.nasa.gov/
Astromaterials Curation	http://www-curator.jsc.nasa.gov/