# Antarctic Meteorite Newsletter

Volume 36, Number 1 February 2013

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

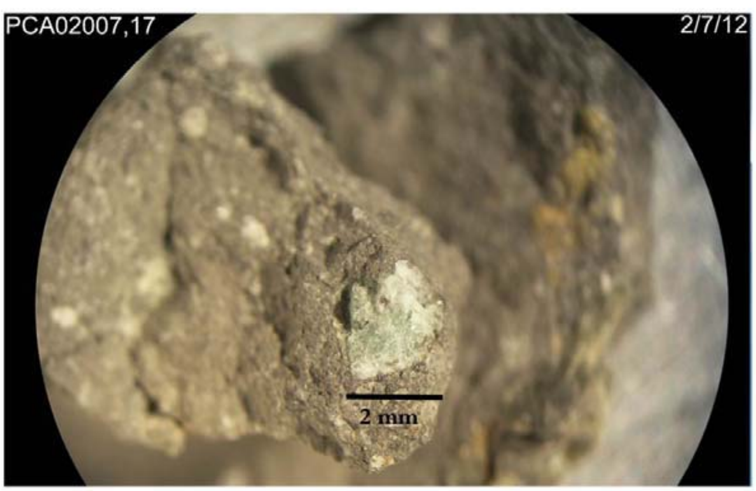
*Kevin Righter, NASA-JSC*

### New Meteorites

This newsletter reports 365 new meteorites from the 2010 and 2011 ANSMET seasons from the Miller Range (MIL11), Dominion Range (DOM10), La Paz Ice Field (LAP10), Patuxent Range (PAT10), Buckley Island (BUC10), and Allan Hills (ALH10) regions. Detailed descriptions are provided for one each of CV and CR chondrites, several shock blackened L chondrites, an L3.8 chondrite, an EL6 chondrite, and 9 HED meteorites.

### Calcium sulfate found in lunar meteorite PCA 02007

In the process of sampling lunar meteorite PCA 02007 in Spring of 2012, an unusual light greenish-blue crystal was discovered upon breaking open a fresh surface of the sample. In order to identify this mineral, we obtained a Raman spectrum (non-destructive to the sample), and found that it is a calcium sulfate either anhydrite or gypsum. This unexpected finding might be of potential interest to the community so we are announcing it here. Any interested researchers can make a request for this sample in the upcoming Spring 2013 MWG meeting (request deadline is March 8th).

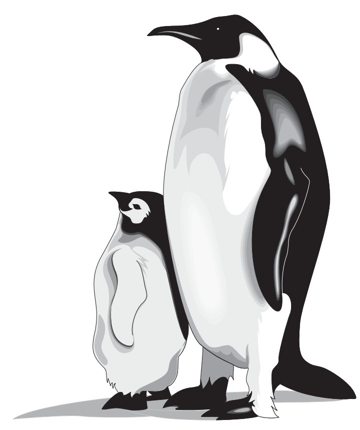



*Unusual greenish-blue calcium sulfate crystal found in meteorite PCA 02007*

*continued on p.2*

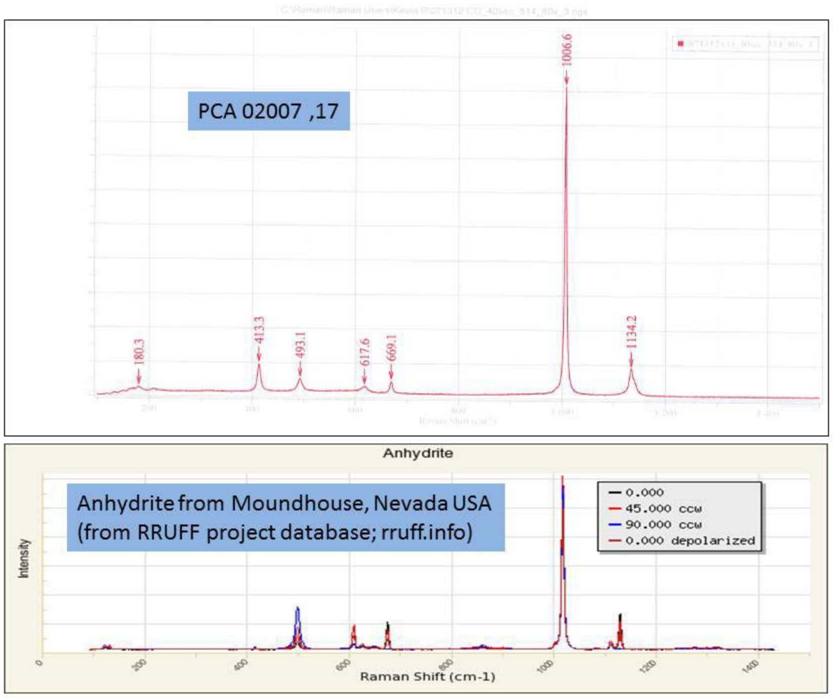
## Inside this Issue





**Sample Request Deadline**
**March 8, 2013**

**MWG Meets**
**March 23-24, 2013**




*Raman spectra of PCA 02007 crystal compared to anhydrite from Moundhouse, Nevada (USA)*

## Meteorite reclassifications/corrections

**MIL 11207 revised description** (announced vol. 35, no. 2): The section is comprised of coarse grained (100-200 micron), equigranular olivine, sometimes poikilitically enclosed in mm-sized feldspar with sulfides, oxides and hornblende (yes, hornblende). Olivine compositions are $Fa_{40}$, feldspar is $An_{10}Or_4$. The meteorite is an R6 chondrite with pronounced shock effects. It is petrologically distinct from the LAP 04840 pairing group, although it shares the common feature of being a hydrous phase bearing R chondrite.

**MIL 090982 reclassification** (announced vol. 35, no. 1): This sample was originally announced as an LL6 chondrite (without a detailed description), but re-examination has revealed it is a CK6 chondrite. A new description is presented in the section with other new petrographic descriptions.

**QUE 99038 reclassification** (announced vol. 24, no. 1): This sample was originally classified as a CM2 chondrite. However, A. Rubin (UCLA) brought to our attention several important observations suggesting this classification is incorrect. Inspection of the JSC library section (,9) reveals many large and igneous rimmed chondrules, many CAI and other inclusions, and only a small amount of matrix. The high % matrix and small chondrules typical of a CM2 chondrite are absent. We therefore re-classify this sample as a CV3 chondrite.

**LAP 03834 reclassification** (announced vol. 29, no. 1): This sample was originally classified as a CK3 chondrite, but chemical analyses reveal that it (as well as MET 01149 which we reclassified a few years ago) is very close in composition (Zn/Mn vs. Al/Mn) to many other R chondrites (Isa, M. et al., 2011, LPSC abstract #1876). This information, together with the observation that there is abundant sulfide, but little to no magnetite has led us to reclassify this sample as an R3 chondrite.

**MAC 02453 reclassification** (announced vol. 28, no. 1): This sample was originally classified as a CK5 chondrite, but chemical analyses reveal that it is very close in composition (Zn/Mn vs. Al/Mn) to many other LL chondrites (Isa, M. et al., 2011, LPSC abstract #1876). This information, together with the observation that there is metal present and no magnetite, has led us to reclassify this sample as an LL5 chondrite.

**LAP 03923 reclassification** (announced vol. 29, no. 1): This sample was originally classified as a CK5 chondrite, but chemical analyses reveal that it is very close in composition (Zn/Mn vs. Al/Mn) to many other LL chondrites (Isa, M. et al., 2011, LPSC abstract #1876). This information, together with the observation that there is metal present and no magnetite, has led us to reclassify this sample as an LL5 chondrite.

### New book will highlight US Antarctic meteorite collection

The US Antarctic meteorite collection has been growing steadily since the mid-70s when the program got started. Despite the prominent role the collection has played in the field of meteoritics and defining new meteorite groups, there has never been a comprehensive summary of the collection that focuses on its various components such as field collecting, classification, curation, and influential individual samples. Therefore last year we organized a book project through the American Geophysical Union (AGU) Press that will include reviews of the history, field collection, classification, curation, specific meteorite groups (martian, lunar, achondrites, primitive chondrites, ungrouped meteorites), exposure ages, and collection statistics. The chapters are being reviewed currently, with revisions due in the Spring, and book appearing in the Summer or Fall. We hope this book will provide an overarching summary of the more important aspects of the collection, and be a valuable resource for the community.

## Report on the 2012-2013 ANSMET Field Season

*Ralph Harvey, ANSMET*

I get asked for my opinion regarding the differences between Science and Engineering (with capital S and E respectively) a lot. This is probably because like engineering, ANSMET is a hybrid of science and service with a heavy dependence on technology. One of the differences that fascinates me is how we define "success". For a scientist, a non-result (or a negative result) that throws out your hypothesis can easily be as valuable and important as results that confirming your theories. For an engineer designing a new solar panel, or robot, or (God forbid) a bridge, failure often isn't an option. As a result, the two kinds of research tend to define success in very different ways.

Which leads me to the recently completed ANSMET field season of 2012-2013, where we definitely had success but not quite what the pre-season plans would have suggested. Two parties went into the field as planned and on schedule; a 4-person reconnaissance party sent to explore some promising sites in the most southerly reaches of the Transantarctic Mountains, and an 8-person systematic searching team sent to the Larkman Nunataks and the ice fields adjacent to Mts Cecily, Emily and Raymond in the Grosvenor Mountains. The recon team recovered meteorites from two previously visited ice fields near the Klein Glacier landing site and a previously unvisited site in the Graves Nunatak region; but as they moved to sites along the upper Robison Glacier, the weather stopped cooperating. At one stage they endured the longest weather-related work-stoppage in ANSMET's 37 year history, a full 14 days. It wasn't all about snow and wind, either; warmer than usual weather in the McMurdo Sound region meant the Pegasus runway was too soft for use by wheeled aircraft, meaning the US Antarctic Program's ski-equipped aircraft (LC-130's and Twin Otters) had to do double duty, bringing cargo from the civilized world as well as supporting activities in the field and at remote stations. Together these factors led to a recon season where we managed to visit less than half of the sites we had hoped for, and the total number of meteorite recoveries was correspondingly low- only 63 specimens. In the end, success could be measured in the few new sites we knocked off our list of potential targets, but much work remains for us in that part of the Transantarctics.

The systematic team had much better luck with the weather. After a few days of acclimatization at the Mt. Bumstead ice fields, the team traversed to Larkman Nunatak. The ice fields in this area are relatively small, but there's a challenge hiding at the foot of Larkman Nunatak- a moraine brimming with meteorites. Previous visits to the site emphasized the desire not only to complete searching of the ice fields but also to finish a highly-controlled methodical foot search in that moraine. Neanderthals that we are, we even went so far as to try a few new things, like smaller wire-supported flags, battery powered drills for marking paths and finds, and the use of a metal-detector for double-checking. The payoff appears to have been substantial; about 331 specimens total for the season, including many that appear "unusual" and contrary to expectations, of significant size.

With searching at Larkman completed, the team cleaned up camp and set the course for the Grosvenor ice fields. Just as they set off, however, one of the field party members took ill, and the traverse was quickly cancelled. ANY medical situation in the field has the potential to turn disastrous, so the stricken field party member was quickly evacuated back to McMurdo and eventually to Christchurch, where tests proved (thankfully) that no serious harm resulted. This incident, occurring when it did, pretty much ended the season for the systematic team; but their quick and appropriate actions were roundly applauded within USAP and demonstrated the value of the careful preparations and training ANSMET is known for in the Antarctic Program. The systematic team then had to deal with the previously mentioned airplane shortage and it was another week before they could get out of the field. The final total for both field teams was about 400 finds, but may be lower given the likely inclusion of some terrestrial specimens.

One important programmatic item to note: historically ANSMET has been supported by both NASA and the National Science Foundation. Many of you know NSF will no longer directly support the program after this coming summer. NASA has made it clear they understand the value of continuing ANSMET field work with as few interruptions as possible, so there is very little danger of the program going away. But as we transition to a phase where NASA is the sole source of ANSMET funding, particularly in the current fiscal climate, changes in our operations are likely. One possible result of this transition may be that ANSMET, for the first time in over 20 years, misses a field season. Given how many of you rely on a continuous supply of new ANSMET samples for your research, we felt it was important to let you know of this potential interruption.

**Report from the Smithsonian**

*Cari Corrigan, Geologist*
*(Dept. of Mineral Sci.)*

This newsletter announces the classification of 365 meteorites from Allan Hills, Buckley Island, Dominion Range, La Paz Ice Field, Miller Range and Patuxent Range. Since the last newsletter, we have completed an inventory of the Antarctic Meteorite Collection at the Museum Support Center and have reorganized storage of the meteorites. This will make it more efficient when processing requests.

Andrew Beck, a post-doc at the Smithsonian, was a member of the 2012 ANSMET team. Andrew had an enjoyable time on the ice finding interesting meteorites for us to classify and for you to study.

*Smithsonian post-doc Andrew in Antarctica during the 2012 ANSMET season*

## 2010 and 2011 Collection

Pages 7-21 contain preliminary descriptions and classifications of meteorites that were completed since publication of issue 35(2), Sept. 2012. 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:

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U.S. National Museum of Natural History - Smithsonian Institution
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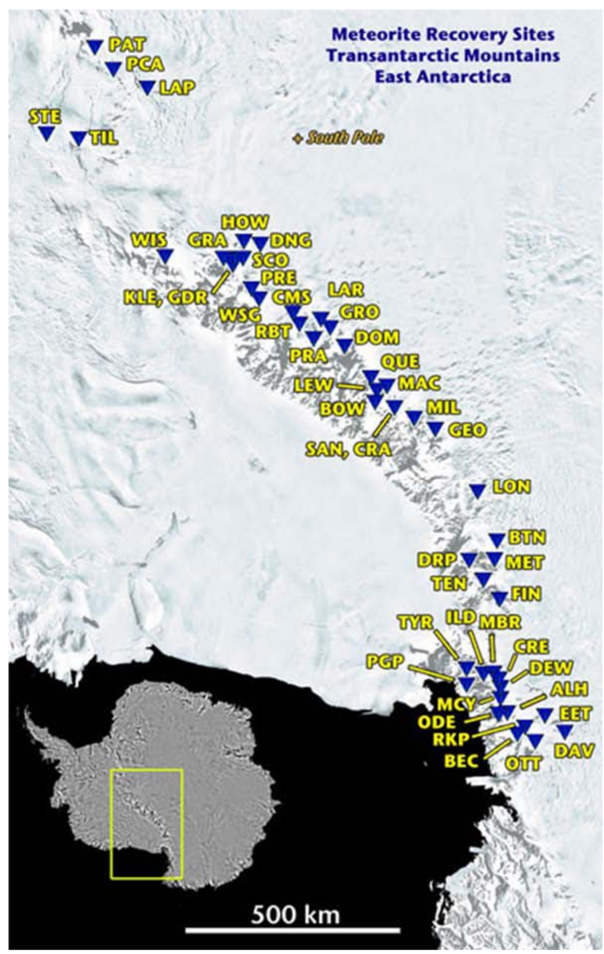
### Antarctic Meteorite Locations

ALH — Allan Hills
BEC — Beckett Nunatak
BOW — Bowden Neve
BTN — Bates Nunataks
BUC — Buckley Island
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 |
|---|---|---|---|---|---|---|
| ALH 10910 ~ | 444.1 | L5 CHONDRITE | B/C | B/C | | |
| ALH 10911 ~ | 218.9 | L6 CHONDRITE | B/C | B/C | | |
| ALH 10912 ~ | 60.3 | H6 CHONDRITE | A/B | A | | |
| | | | | | | |
| BUC 10930~ | 374.5 | L6 CHONDRITE | B/Ce | B/C | | |
| BUC 10932~ | 879.9 | L6 CHONDRITE | B/C | B/C | | |
| BUC 10933 | 486.0 | CR2 CHONDRITE | B/Ce | A/B | 3-7 | 1-3 |
| BUC 10934~ | 472.2 | L6 CHONDRITE | B/C | B/C | | |
| BUC 10935~ | 362.4 | L6 CHONDRITE | B/Ce | B/C | | |
| BUC 10936~ | 335.2 | L5 CHONDRITE | B | A/B | | |
| BUC 10937~ | 234.6 | L6 CHONDRITE | C | C | | |
| BUC 10938~ | 288.0 | L5 CHONDRITE | B/C | A/B | | |
| BUC 10939~ | 143.9 | L6 CHONDRITE | C | C | | |
| BUC 10940~ | 161.7 | H6 CHONDRITE | B/C | A/B | | |
| BUC 10941~ | 118.8 | L6 CHONDRITE | B/C | A/B | | |
| BUC 10942 | 95.4 | L6 CHONDRITE | B/C | A | 24-25 | 20 |
| BUC 10945~ | 80.3 | H6 CHONDRITE | B/Ce | A/B | | |
| BUC 10946~ | 28.3 | L5 CHONDRITE | B/C | A/B | | |
| BUC 10947~ | 47.2 | H5 CHONDRITE | B/C | A | | |
| BUC 10948~ | 41.6 | L6 CHONDRITE | B/C | A/B | | |
| BUC 10949~ | 22.6 | L6 CHONDRITE | B/C | A/B | | |
| BUC 10950~ | 10.3 | H6 CHONDRITE | C | A | | |
| BUC 10951~ | 26.1 | L6 CHONDRITE | C | C | | |
| BUC 10952~ | 5.8 | L6 CHONDRITE | C | A/B | | |
| BUC 10953 | 7.9 | H4 CHONDRITE | C | A | 17-18 | 15-20 |
| BUC 10954~ | 22.7 | L6 CHONDRITE | C | A | | |
| BUC 10955~ | 15.1 | L6 CHONDRITE | C | A/B | | |
| BUC 10956~ | 20.4 | H5 CHONDRITE | C | A/B | | |
| BUC 10957~ | 4.9 | L6 CHONDRITE | C | A/B | | |
| | | | | | | |
| DOM 10005~ | 1083.3 | LL6 CHONDRITE | A/B | A/B | | |
| DOM 10011~ | 22.9 | H6 CHONDRITE | C | A/B | | |
| DOM 10012~ | 44.2 | L5 CHONDRITE | B/C | A/B | | |
| DOM 10014~ | 43.8 | LL5 CHONDRITE | B | A/B | | |
| DOM 10015~ | 45.1 | LL6 CHONDRITE | B | B | | |
| DOM 10016~ | 58.7 | LL5 CHONDRITE | B | A/B | | |
| DOM 10017~ | 36.6 | LL5 CHONDRITE | B | B | | |
| DOM 10018~ | 31.6 | L6 CHONDRITE | B/C | B | | |
| DOM 10019~ | 17.6 | LL5 CHONDRITE | B/C | A/B | | |
| DOM 10020~ | 27.7 | L5 CHONDRITE | A/B | A/B | | |
| DOM 10021~ | 13.2 | LL5 CHONDRITE | B | A | | |
| DOM 10022~ | 23.5 | LL5 CHONDRITE | A/B | A | | |
| DOM 10023~ | 10.4 | L6 CHONDRITE | B | A/B | | |
| DOM 10024~ | 11.7 | H6 CHONDRITE | B/C | A | | |
| DOM 10025~ | 9.3 | H5 CHONDRITE | B/C | A | | |
| DOM 10026~ | 23.1 | L5 CHONDRITE | B | A | | |
| DOM 10027~ | 15.0 | L5 CHONDRITE | B/C | A | | |
| DOM 10029~ | 25.7 | H5 CHONDRITE | B/C | A/B | | |
| DOM 10040~ | 17.4 | H5 CHONDRITE | C | A/B | | |
| DOM 10041~ | 24.0 | LL6 CHONDRITE | B/C | B | | |

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| DOM 10042~ | 26.7 | L6 CHONDRITE | C | A/B | | |
| DOM 10043~ | 33.1 | LL6 CHONDRITE | A/B | A | | |
| DOM 10044~ | 17.8 | LL5 CHONDRITE | B | A/B | | |
| DOM 10045~ | 12.7 | L6 CHONDRITE | C | A/B | | |
| DOM 10046~ | 15.1 | LL6 CHONDRITE | B/C | A/B | | |
| DOM 10047~ | 22.4 | LL5 CHONDRITE | B/C | B | | |
| DOM 10048~ | 24.7 | LL6 CHONDRITE | B/C | B | | |
| DOM 10049~ | 12.0 | H5 CHONDRITE | C | B/C | | |
| DOM 10310~ | 78.5 | LL5 CHONDRITE | B | A | | |
| DOM 10311~ | 58.6 | LL5 CHONDRITE | B/C | A/B | | |
| DOM 10312~ | 40.4 | LL6 CHONDRITE | B/C | A/B | | |
| DOM 10313~ | 44.4 | LL5 CHONDRITE | B | A | | |
| DOM 10314~ | 52.6 | LL5 CHONDRITE | B | A/B | | |
| DOM 10315~ | 54.9 | LL5 CHONDRITE | B/C | B | | |
| DOM 10316~ | 60.5 | LL6 CHONDRITE | B | A | | |
| DOM 10317~ | 36.0 | H6 CHONDRITE | C | A/B | | |
| DOM 10318~ | 57.0 | LL6 CHONDRITE | B | A | | |
| DOM 10319~ | 36.6 | LL6 CHONDRITE | B | A/B | | |
| DOM 10320~ | 26.5 | LL5 CHONDRITE | B/C | A | | |
| DOM 10321~ | 25.2 | H6 CHONDRITE | B/C | A | | |
| DOM 10322~ | 11.3 | LL4-5 CHONDRITE | B/C | A | | |
| DOM 10323~ | 8.3 | LL6 CHONDRITE | B/C | A | | |
| DOM 10324~ | 16.7 | H6 CHONDRITE | B/C | A | | |
| DOM 10325~ | 39.1 | LL6 CHONDRITE | A/B | A | | |
| DOM 10326~ | 24.0 | LL6 CHONDRITE | A/B | A | | |
| DOM 10327~ | 21.3 | L5 CHONDRITE | B | A | | |
| DOM 10328~ | 23.0 | LL6 CHONDRITE | B | A | | |
| DOM 10329~ | 12.2 | LL6 CHONDRITE | A/B | A | | |
| DOM 10352~ | 24.8 | H5 CHONDRITE | B/C | A | | |
| DOM 10353~ | 12.2 | H6 CHONDRITE | B/C | A | | |
| DOM 10354~ | 17.3 | LL6 CHONDRITE | B/C | A | | |
| DOM 10355~ | 30.5 | LL6 CHONDRITE | A/B | A | | |
| DOM 10356~ | 21.7 | LL6 CHONDRITE | A/B | A | | |
| DOM 10357~ | 32.4 | LL6 CHONDRITE | B/C | A | | |
| DOM 10358~ | 30.7 | LL6 CHONDRITE | A/B | A | | |
| DOM 10359~ | 22.7 | LL6 CHONDRITE | A/B | A | | |
| DOM 10360~ | 4.4 | L6 CHONDRITE | B | A/B | | |
| DOM 10361~ | 9.2 | H5 CHONDRITE | B/C | A | | |
| DOM 10362~ | 10.7 | H5 CHONDRITE | B/C | A/B | | |
| DOM 10364~ | 25.4 | L5 CHONDRITE | B | A/B | | |
| DOM 10365~ | 3.5 | H6 CHONDRITE | B/C | A | | |
| DOM 10366~ | 9.1 | H6 CHONDRITE | B/C | A | | |
| DOM 10367~ | 6.1 | H6 CHONDRITE | B/C | A | | |
| DOM 10368~ | 2.4 | L6 CHONDRITE | B/C | A | | |
| DOM 10369~ | 10.8 | H6 CHONDRITE | B/C | A | | |
| DOM 10480~ | 12.9 | L6 CHONDRITE | C | B | | |
| DOM 10481~ | 10.2 | L6 CHONDRITE | C | A/B | | |
| DOM 10482~ | 12.8 | L6 CHONDRITE | B | A/B | | |
| DOM 10483~ | 6.8 | H6 CHONDRITE | C | A/B | | |
| DOM 10484~ | 5.9 | L5 CHONDRITE | C | A/B | | |
| DOM 10485~ | 27.5 | LL6 CHONDRITE | B | A/B | | |
| DOM 10486~ | 24.3 | L5 CHONDRITE | B/C | B | | |
| DOM 10487~ | 22.9 | L6 CHONDRITE | C | B | | |
| DOM 10488~ | 24.1 | L6 CHONDRITE | C | B | | |
| DOM 10489~ | 12.7 | LL6 CHONDRITE | C | B | | |

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| DOM 10495~ | 51.6 | L6 CHONDRITE | C | A/B | | |
| DOM 10496~ | 55.7 | LL6 CHONDRITE | A/B | A/B | | |
| DOM 10497~ | 34.3 | LL6 CHONDRITE | C | B | | |
| DOM 10498~ | 27.0 | LL6 CHONDRITE | A/B | A/B | | |
| DOM 10499~ | 34.3 | LL6 CHONDRITE | B/C | B | | |
| DOM 10500~ | 78.4 | LL6 CHONDRITE | B | A | | |
| DOM 10501~ | 52.1 | LL6 CHONDRITE | B/C | B | | |
| DOM 10502~ | 53.0 | LL6 CHONDRITE | B/C | B | | |
| DOM 10503~ | 73.7 | LL6 CHONDRITE | B/C | B | | |
| DOM 10504~ | 53.8 | LL6 CHONDRITE | B/C | B | | |
| DOM 10505~ | 56.8 | LL6 CHONDRITE | B | A | | |
| DOM 10506~ | 52.1 | H5 CHONDRITE | C | C | | |
| DOM 10507~ | 35.8 | LL5 CHONDRITE | B/C | A | | |
| DOM 10508~ | 46.5 | LL6 CHONDRITE | A/B | A/B | | |
| DOM 10509~ | 38.4 | L5 CHONDRITE | B/C | A/B | | |
| DOM 10510~ | 30.0 | L6 CHONDRITE | C | B | | |
| DOM 10511~ | 14.5 | L5 CHONDRITE | C | A/B | | |
| DOM 10512~ | 32.9 | LL6 CHONDRITE | B | B | | |
| DOM 10513~ | 30.2 | LL6 CHONDRITE | B/C | B | | |
| DOM 10514~ | 22.5 | LL6 CHONDRITE | B/C | B | | |
| DOM 10515~ | 23.9 | LL6 CHONDRITE | B/C | B | | |
| DOM 10516~ | 13.3 | L6 CHONDRITE | C | B | | |
| DOM 10517~ | 19.6 | LL6 CHONDRITE | C | B/C | | |
| DOM 10518~ | 9.0 | H5 CHONDRITE | C | B/C | | |
| DOM 10519~ | 9.9 | H6 CHONDRITE | C | B | | |
| DOM 10530~ | 17.9 | H6 CHONDRITE | C | A | | |
| DOM 10531~ | 15.2 | H6 CHONDRITE | C | A | | |
| DOM 10532~ | 8.5 | H6 CHONDRITE | C | A/B | | |
| DOM 10533~ | 15.4 | LL5 CHONDRITE | B | B | | |
| DOM 10534 | 13.0 | L6 CHONDRITE | B/C | B | 26 | 21 |
| DOM 10535~ | 9.2 | LL5 CHONDRITE | B | B | | |
| DOM 10536~ | 17.1 | LL5 CHONDRITE | Be | B | | |
| DOM 10537~ | 13.2 | LL6 CHONDRITE | Be | B | | |
| DOM 10538~ | 13.9 | LL6 CHONDRITE | B/C | B | | |
| DOM 10539~ | 29.0 | LL6 CHONDRITE | B/C | B | | |
| DOM 10540~ | 22.3 | H6 CHONDRITE | B/C | A | | |
| DOM 10541~ | 30.4 | LL5 CHONDRITE | A/B | A | | |
| DOM 10542~ | 38.8 | L5 CHONDRITE | B/C | A/B | | |
| DOM 10543~ | 33.4 | LL5 CHONDRITE | A/B | A | | |
| DOM 10544~ | 41.6 | H6 CHONDRITE | B/C | A | | |
| DOM 10545~ | 38.2 | LL6 CHONDRITE | B/C | A/B | | |
| DOM 10546~ | 41.1 | LL5 CHONDRITE | A/B | A | | |
| DOM 10547~ | 25.2 | LL6 CHONDRITE | A/B | A/B | | |
| DOM 10548~ | 24.9 | L6 CHONDRITE | B/C | A | | |
| DOM 10549~ | 37.7 | L5 CHONDRITE | B/C | A | | |
| DOM 10566 | 38.5 | L5 CHONDRITE | C | A | 25 | 21 |
| DOM 10590~ | 20.5 | L6 CHONDRITE | C | B | | |
| DOM 10591~ | 39.2 | H6 CHONDRITE | C | B | | |
| DOM 10592~ | 39.2 | LL6 CHONDRITE | C | B | | |
| DOM 10593~ | 47.5 | L6 CHONDRITE | B/C | B | | |
| DOM 10594~ | 39.3 | L6 CHONDRITE | C | B | | |
| DOM 10595 | 35.0 | L5 CHONDRITE | B | A | 25 | 21 |
| DOM 10596~ | 34.3 | L6 CHONDRITE | C | B/C | | |
| DOM 10597 | 47.5 | L3.8 CHONDRITE | B | B | 3-41 | 4-20 |
| DOM 10598~ | 28.1 | L6 CHONDRITE | C | A/B | | |

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| DOM 10599~ | 27.2 | L6 CHONDRITE | C | B | | |
| DOM 10600~ | 31.4 | H6 CHONDRITE | C | B | | |
| DOM 10601~ | 26.2 | H6 CHONDRITE | C | B | | |
| DOM 10602~ | 16.4 | LL6 CHONDRITE | A/B | A | | |
| DOM 10603~ | 13.0 | LL6 CHONDRITE | B/C | B | | |
| DOM 10604~ | 30.1 | LL6 CHONDRITE | B/C | B | | |
| DOM 10605~ | 23.8 | H6 CHONDRITE | B/C | B | | |
| DOM 10606~ | 25.0 | LL6 CHONDRITE | C | B | | |
| DOM 10607~ | 27.1 | LL5 CHONDRITE | B/C | B | | |
| DOM 10608~ | 31.4 | LL6 CHONDRITE | B/C | B | | |
| DOM 10609~ | 31.8 | H5 CHONDRITE | C | B | | |
| DOM 10630~ | 17.3 | LL6 CHONDRITE | B/C | B | | |
| DOM 10631~ | 12.7 | H5 CHONDRITE | C | A/B | | |
| DOM 10632~ | 14.6 | LL5 CHONDRITE | B | A/B | | |
| DOM 10633~ | 28.8 | LL6 CHONDRITE | B/C | B | | |
| DOM 10634~ | 20.0 | H6 CHONDRITE | C | B | | |
| DOM 10635~ | 15.2 | LL6 CHONDRITE | B/C | A/B | | |
| DOM 10636~ | 17.8 | LL6 CHONDRITE | B/C | A/B | | |
| DOM 10637~ | 27.0 | LL6 CHONDRITE | B | A/B | | |
| DOM 10638~ | 15.3 | LL6 CHONDRITE | B | A/B | | |
| DOM 10639~ | 14.6 | L5 CHONDRITE | C | A/B | | |
| DOM 10810~ | 50.7 | LL6 CHONDRITE | B | B | | |
| DOM 10811~ | 48.8 | L6 CHONDRITE | C | A/B | | |
| DOM 10812~ | 33.9 | L5 CHONDRITE | C | A/B | | |
| DOM 10813~ | 36.1 | LL6 CHONDRITE | C | B | | |
| DOM 10814~ | 23.5 | LL6 CHONDRITE | B/C | B | | |
| DOM 10815~ | 27.8 | LL6 CHONDRITE | B | A/B | | |
| DOM 10816~ | 22.5 | L6 CHONDRITE | B/C | B | | |
| DOM 10817~ | 18.1 | LL6 CHONDRITE | B/C | B | | |
| DOM 10818~ | 31.6 | L5 CHONDRITE | B/C | B | | |
| DOM 10819~ | 25.9 | LL6 CHONDRITE | B/C | B | | |
| HOW 10920 ~ | 711.3 | LL5 CHONDRITE | A/B | B | | |
| LAP 10020 ~ | 344.9 | LL5 CHONDRITE | B/C | A | | |
| LAP 10021 ~ | 379.4 | LL5 CHONDRITE | A/B | A | | |
| LAP 10022 ~ | 382.4 | LL5 CHONDRITE | B/C | A | | |
| LAP 10023 ~ | 378.5 | LL5 CHONDRITE | B/C | A | | |
| LAP 10024 ~ | 177.2 | LL5 CHONDRITE | A/B | A | | |
| LAP 10060 | 31.0 | HOWARDITE | A | A/B | | 24-60 |
| LAP 10061 ~ | 81.2 | LL5 CHONDRITE | B | B | | |
| LAP 10062 ~ | 63.7 | LL5 CHONDRITE | B | A/B | | |
| LAP 10063 ~ | 97.6 | LL5 CHONDRITE | B | A/B | | |
| LAP 10064 ~ | 21.0 | LL6 CHONDRITE | A/B | A/B | | |
| LAP 10065 ~ | 30.1 | LL5 CHONDRITE | B | B | | |
| LAP 10066 ~ | 43.5 | LL5 CHONDRITE | A/B | A/B | | |
| LAP 10067 ~ | 29.2 | LL6 CHONDRITE | B | B | | |
| LAP 10068 ~ | 30.7 | L5 CHONDRITE | B | B | | |
| LAP 10069 ~ | 7.1 | L5 CHONDRITE | B | B | | |
| LAP 10090 ~ | 12.1 | LL5 CHONDRITE | B | B | | |
| LAP 10091 ~ | 8.2 | L5 CHONDRITE | C | B | | |
| LAP 10092 ~ | 18.1 | H6 CHONDRITE | B/C | B | | |
| LAP 10093 ~ | 13.5 | H6 CHONDRITE | C | B | | |
| LAP 10094 | 10.1 | H5 CHONDRITE | A/B | B | 16 | 14 |
| LAP 10095 | 13.9 | H5 CHONDRITE | A/B | B | 16 | 14 |

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| LAP 10096 ~ | 28.1 | LL5 CHONDRITE | B | B | | |
| LAP 10097 ~ | 24.3 | LL5 CHONDRITE | B | B | | |
| LAP 10098 ~ | 46.5 | LL5 CHONDRITE | B | B | | |
| LAP 10099 ~ | 41.4 | LL5 CHONDRITE | B | B | | |
| LAP 10100 ~ | 11.5 | LL6 CHONDRITE | B/C | A | | |
| LAP 10102 ~ | 17.5 | LL6 CHONDRITE | B/C | A | | |
| LAP 10103 ~ | 23.7 | LL5 CHONDRITE | B/C | A | | |
| LAP 10104 ~ | 22.0 | L6 CHONDRITE | A/B | A | | |
| LAP 10105 ~ | 9.2 | LL5 CHONDRITE | B/C | A | | |
| LAP 10107 ~ | 12.2 | LL5 CHONDRITE | B/C | A | | |
| LAP 10108 | 14.9 | LL5 CHONDRITE | B/C | A | | |
| LAP 10130 | 352.6 | EL6 CHONDRITE | Be | A | | 0-1 |
| LAP 10131 ~ | 487.0 | LL6 CHONDRITE | B | A | | |
| LAP 10132 ~ | 519.0 | LL5 CHONDRITE | B | A | | |
| LAP 10133 ~ | 365.2 | LL5 CHONDRITE | B | A | | |
| LAP 10134 ~ | 482.9 | LL6 CHONDRITE | A/B | A | | |
| LAP 10135 ~ | 304.7 | LL5 CHONDRITE | B/C | A | | |
| LAP 10136 ~ | 418.6 | LL5 CHONDRITE | B | A | | |
| LAP 10137 ~ | 444.8 | LL5 CHONDRITE | B/C | A/B | | |
| LAP 10138 ~ | 353.9 | LL5 CHONDRITE | B/C | A | | |
| LAP 10139 ~ | 166.7 | LL5 CHONDRITE | B/C | A | | |
| PAT 10200 ~ | 5908.4 | LL5 CHONDRITE | B | B/C | | |
| PAT 10201 ~ | 1674.1 | LL5 CHONDRITE | B | B | | |
| PAT 10202 ~ | 343.4 | LL5 CHONDRITE | B/C | A/B | | |
| PAT 10204 ~ | 103.6 | LL5 CHONDRITE | A | A | | |
| PAT 10205 ~ | 15.9 | L5 CHONDRITE | B/C | B | | |
| PAT 10206 ~ | 19.7 | L5 CHONDRITE | B/C | B | | |
| PAT 10207 ~ | 6.3 | L6 CHONDRITE | B/C | B | | |
| PAT 10208 ~ | 13.4 | L5 CHONDRITE | B/C | B | | |
| PAT 10209 ~ | 8.3 | LL5 CHONDRITE | A/B | A/B | | |
| PAT 10210 ~ | 5.6 | LL6 CHONDRITE | B/C | B | | |
| PAT 10211 ~ | 6.8 | H5 CHONDRITE | B/C | A | | |
| PAT 10212 ~ | 2.4 | H6 CHONDRITE | B/C | A | | |
| PAT 10213 ~ | 5.1 | H6 CHONDRITE | B/C | A | | |
| PAT 10214 ~ | 14.3 | H6 CHONDRITE | B/C | A | | |
| PAT 10215 ~ | 9.1 | L6 CHONDRITE | B/C | A/B | | |
| PAT 10216 ~ | 13.6 | LL6 CHONDRITE | A/B | A/B | | |
| PAT 10217 ~ | 9.0 | L6 CHONDRITE | B/C | A | | |
| PAT 10218 ~ | 5.6 | L6 CHONDRITE | B/C | A/B | | |
| PAT 10219 ~ | 2.5 | LL6 CHONDRITE | A/B | A/B | | |
| PAT 10220 ~ | 1.8 | L5 CHONDRITE | B/C | B | | |
| PAT 10221 ~ | 2.7 | L6 CHONDRITE | C | A/B | | |
| PAT 10222 ~ | 3.9 | L6 CHONDRITE | B/C | B | | |
| PAT 10223 ~ | 2.9 | L5 CHONDRITE | B/C | B | | |
| PAT 10224 ~ | 2.7 | L5 CHONDRITE | C | B | | |
| PAT 10225 ~ | 4.3 | H6 CHONDRITE | C | B | | |
| PAT 10226 ~ | 5.6 | L5 CHONDRITE | B/C | B | | |
| PAT 10227 ~ | 2.2 | H6 CHONDRITE | B/C | B | | |
| PAT 10228 ~ | 3.3 | LL6 CHONDRITE | A | A | | |
| PAT 10229 ~ | 1.6 | H6 CHONDRITE | C | B | | |
| PAT 10230 ~ | 8.0 | L6 CHONDRITE | B/C | A | | |
| PAT 10231 ~ | 9.2 | H6 CHONDRITE | B/C | A | | |
| PAT 10232 ~ | 18.4 | H6 CHONDRITE | B/C | A | | |
| PAT 10233 ~ | 7.4 | L6 CHONDRITE | B/C | A | | |

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| PAT 10234 ~ | 14.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10235 ~ | 5.9 | L5 CHONDRITE | B/C | A | | |
| PAT 10236 ~ | 6.1 | L6 CHONDRITE | A/B | A/B | | |
| PAT 10237 ~ | 3.8 | H6 CHONDRITE | B/C | A | | |
| PAT 10238 ~ | 3.2 | H6 CHONDRITE | B/C | A | | |
| PAT 10239 ~ | 3.1 | H5 CHONDRITE | B/C | A/B | | |
| PAT 10240 ~ | 11.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10241 ~ | 4.0 | H6 CHONDRITE | B/C | A | | |
| PAT 10242 ~ | 4.4 | H5 CHONDRITE | B/C | A | | |
| PAT 10243 ~ | 4.0 | H6 CHONDRITE | B/C | A | | |
| PAT 10244 ~ | 2.4 | LL6 CHONDRITE | A/B | A/B | | |
| PAT 10245 ~ | 2.0 | L6 CHONDRITE | B/C | A | | |
| PAT 10246 ~ | 1.1 | LL6 CHONDRITE | A/B | A | | |
| PAT 10247 ~ | 1.8 | H6 CHONDRITE | B/C | A | | |
| PAT 10248 ~ | 2.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10249 ~ | 2.7 | H6 CHONDRITE | B/C | A | | |
| PAT 10250 ~ | 2.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10251 ~ | 1.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10252 ~ | 7.2 | L6 CHONDRITE | B/C | A | | |
| PAT 10253 ~ | 8.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10254 ~ | 2.7 | L5 CHONDRITE | B/C | A | | |
| PAT 10255 ~ | 2.8 | L6 CHONDRITE | B/C | A/B | | |
| PAT 10256 ~ | 1.8 | H6 CHONDRITE | B/C | A | | |
| PAT 10257 ~ | 19.8 | L6 CHONDRITE | B/C | A | | |
| PAT 10258 ~ | 2.0 | L5 CHONDRITE | B/C | A | | |
| PAT 10259 ~ | 6.3 | H6 CHONDRITE | B/C | A | | |
| PAT 10260 ~ | 2.8 | L6 CHONDRITE | B/C | A | | |
| PAT 10261 ~ | 1.6 | H6 CHONDRITE | B/C | A | | |
| PAT 10262 ~ | 1.6 | L5 CHONDRITE | B/C | A | | |
| PAT 10263 ~ | 8.5 | L6 CHONDRITE | B/C | A | | |
| PAT 10264 ~ | 1.2 | L5 CHONDRITE | B | A | | |
| PAT 10265 ~ | 6.2 | H6 CHONDRITE | B/C | A | | |
| PAT 10266 ~ | 3.3 | H6 CHONDRITE | B/C | A | | |
| PAT 10267 ~ | 1.3 | L5 CHONDRITE | B | A | | |
| PAT 10268 ~ | 3.5 | L6 CHONDRITE | B/C | A | | |
| PAT 10269 ~ | 1.8 | L6 CHONDRITE | B/C | A | | |
| PAT 10270 ~ | 4.1 | L5 CHONDRITE | C | B | | |
| PAT 10271 ~ | 2.0 | L5 CHONDRITE | C | B | | |
| PAT 10272 ~ | 4.0 | H6 CHONDRITE | C | B | | |
| PAT 10273 ~ | 2.9 | H6 CHONDRITE | C | B | | |
| PAT 10274 ~ | 2.4 | H6 CHONDRITE | C | B | | |
| PAT 10275 ~ | 4.5 | L6 CHONDRITE | C | B | | |
| PAT 10276 ~ | 3.0 | L6 CHONDRITE | C | B | | |
| PAT 10277 ~ | 1.1 | H6 CHONDRITE | C | B | | |
| PAT 10278 ~ | 2.0 | H6 CHONDRITE | C | B | | |
| PAT 10279 ~ | 2.8 | L6 CHONDRITE | C | B | | |
| PAT 10280 ~ | 2.0 | L6 CHONDRITE | B/C | B | | |
| PAT 10281 ~ | 3.8 | H6 CHONDRITE | C | A | | |
| PAT 10282 ~ | 4.0 | L6 CHONDRITE | C | A/B | | |
| PAT 10283 ~ | 5.1 | H5 CHONDRITE | C | B | | |
| PAT 10284 ~ | 2.5 | H6 CHONDRITE | C | B | | |
| PAT 10285 ~ | 3.1 | L6 CHONDRITE | B/C | B | | |
| PAT 10286 ~ | 6.0 | H5 CHONDRITE | C | B | | |
| PAT 10287 ~ | 1.8 | H6 CHONDRITE | C | B | | |
| PAT 10288 ~ | 10.6 | H5 CHONDRITE | C | B | | |

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| PAT 10289 ~ | 11.6 | H6 CHONDRITE | C | B | | |
| PAT 10290 ~ | 4.3 | L6 CHONDRITE | C | A/B | | |
| PAT 10291 ~ | 2.1 | L6 CHONDRITE | B/C | B | | |
| PAT 10292 ~ | 15.7 | L6 CHONDRITE | B/C | B | | |
| PAT 10293 ~ | 2.1 | L6 CHONDRITE | B/C | B | | |
| PAT 10294 ~ | 2.4 | L6 CHONDRITE | C | B | | |
| PAT 10295 ~ | 4.1 | L6 CHONDRITE | C | B | | |
| PAT 10296 ~ | 2.7 | L5 CHONDRITE | B/C | B | | |
| PAT 10297 ~ | 4.1 | H6 CHONDRITE | C | B | | |
| PAT 10298 ~ | 1.5 | L6 CHONDRITE | C | B | | |
| PAT 10299 ~ | 5.2 | H5 CHONDRITE | C | B | | |
| PAT 10300 ~ | 2.5 | L6 CHONDRITE | B/C | A | | |
| PAT 10301 ~ | 2.4 | H5 CHONDRITE | B/C | A | | |
| PAT 10302 ~ | 1.7 | H6 CHONDRITE | B/C | A | | |
| PAT 10303 ~ | 2.4 | H6 CHONDRITE | B/C | A | | |
| PAT 10304 ~ | 1.6 | H6 CHONDRITE | B/C | A | | |
| PAT 10305 ~ | 1.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10306 ~ | 3.0 | H6 CHONDRITE | B/C | A | | |
| PAT 10307 ~ | 1.3 | L6 CHONDRITE | B/C | A | | |
| PAT 10308 | 1.1 | L5 CHONDRITE | B/C | A | 24-27 | 20 |
| PAT 10309 ~ | 2.1 | H6 CHONDRITE | B/C | A | | |
| PAT 10310 ~ | 16.0 | L6 CHONDRITE | C | B | | |
| PAT 10312 ~ | 9.3 | LL5 CHONDRITE | B | B | | |
| PAT 10313 ~ | 9.4 | L6 CHONDRITE | C | B | | |
| PAT 10314 ~ | 7.3 | LL6 CHONDRITE | B | B | | |
| PAT 10315 ~ | 6.8 | L6 CHONDRITE | C | B | | |
| PAT 10316 ~ | 5.5 | L6 CHONDRITE | C | B | | |
| PAT 10317 ~ | 6.6 | H6 CHONDRITE | C | B | | |
| PAT 10318 ~ | 4.8 | L5 CHONDRITE | C | B | | |
| PAT 10319 ~ | 5.5 | L6 CHONDRITE | C | B | | |
| PAT 10320 ~ | 1.1 | L5 CHONDRITE | B/C | A | | |
| PAT 10321 ~ | 1.4 | L6 CHONDRITE | B/C | A | | |
| PAT 10322 ~ | 2.5 | L6 CHONDRITE | B/C | A | | |
| PAT 10323 ~ | 4.2 | H6 CHONDRITE | B/C | A | | |
| PAT 10324 ~ | 3.3 | L6 CHONDRITE | B/C | A | | |
| PAT 10325 ~ | 1.4 | L6 CHONDRITE | B/C | A/B | | |
| MIL 11041 | 42.0 | EUCRITE (BRECCIATED) | A/B | A/B | | 25-62 |
| MIL 11097 | 69.6 | CV3 CHONDRITE | Be | A/B | 0-94 | 48 |
| MIL 11099 | 6.9 | DIOGENITE | B | B | | 30-48 |
| MIL 11197 | 39.3 | DIOGENITE | B | A/B | | 28-29 |
| MIL 11201 | 30.1 | DIOGENITE | A/Be | A | | 30-48 |
| MIL 11291 | 102.1 | EUCRITE (BRECCIATED) | A/B | A | | 25-62 |
| MIL 11292 | 40.3 | EUCRITE (BRECCIATED) | A/B | A | | 28-62 |
| MIL 11294 | 3.8 | HOWARDITE | A/B | A | | 32-60 |
| MIL 11296 | 74.2 | HOWARDITE | A/B | A/B | | 15-47 |

# Table 2

## Newly Classified Specimens Listed By Type

| Sample Number | Weight (g) | Classification | Weathering | Fracturing | % Fa | % Fs |
|---|---|---|---|---|---|---|
| | | Achondrites | | | | |
| MIL 11099 | 6.9 | DIOGENITE | B | B | | 30-48 |
| MIL 11197 | 39.3 | DIOGENITE | B | A/B | | 28-29 |
| MIL 11201 | 30.1 | DIOGENITE | A/Be | A | | 30-48 |
| MIL 11041 | 42.0 | EUCRITE (BRECCIATED) | A/B | A/B | | 25-62 |
| MIL 11291 | 102.1 | EUCRITE (BRECCIATED) | A/B | A | | 25-62 |
| MIL 11292 | 40.3 | EUCRITE (BRECCIATED) | A/B | A | | 28-62 |
| LAP 10060 | 31.0 | HOWARDITE | A | A/B | | 24-60 |
| MIL 11294 | 3.8 | HOWARDITE | A/B | A | | 32-60 |
| MIL 11296 | 74.2 | HOWARDITE | A/B | A/B | | 15-47 |
| | | Carbonaceous Chondrites | | | | |
| BUC 10933 | 486.0 | CR2 CHONDRITE | B/Ce | A/B | 3-7 | 1-3 |
| MIL 11097 | 69.6 | CV3 CHONDRITE | Be | A/B | 0-94 | 48 |
| | | Chondrites - Type 3 | | | | |
| DOM 10597 | 47.5 | L3.8 CHONDRITE | B | B | 3-41 | 4-20 |
| | | E Chondrites | | | | |
| LAP 10130 | 352.6 | EL6 CHONDRITE | Be | A | | 0-1 |

## **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 the Antarctic Meteorite Newsletter vol. 9 (no. 2) (June 1986). Possible pairings were updated in Meteoritical Bulletins 76, 79, 82 through 101, which are available online from the Meteoritical Society webpage:

http://www.lpi.usra.edu/meteor/metbull.php

**DIOGENITE**

MIL 11099 and MIL 11201 with MIL 090112

**EUCRITE (BRECCIATED)**

MIL 11291 with MIL 11041

**L5 CHONDRITE**

DOM 10595 with DOM 10566

## Petrographic Descriptions

Reclassification of MIL 090982:

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 090982 | Miller Range | 20898 | 1.5 x 1.0 x 0.5 | 1.12 | CK6 Chondrite |

Macroscopic Description: Kathleen McBride

The exterior is covered with dull black fusion crust. The interior is a dark gray matrix with mm sized light colored chondrules and clasts.

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

The section consists of few relict chondrules in a matrix of finer-grained silicates, sulfides and abundant magnetite. The meteorite is only slightly weathered. Silicates are homogeneous. Olivine is $Fa_{30-32}$. The meteorite is a CK6 chondrite. It is likely paired with MIL 090521.

| Sample No. | Location | Field No. | Dimensions (cm) | Weight (g) | Classification |
|---|---|---|---|---|---|
| BUC 10933 | Buckley Island | 21432 | 8.0 x 6.0 x 5.5 | 486.00 | CR2 Chondrite |

Macroscopic Description: Cecilia Satterwhite

Patches of black/brown fusion crust are on the weathered brown exterior. The dark gray to black matrix has abundant inclusions/chondrules of various colors and sizes. Some areas are weathered brown with rust. This meteorite was difficult to break.

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

The section exhibits large (up to 3 mm), poorly-defined chondrules and CAIs in a dark matrix of mafics and FeO-rich phyllosilicate. Metal is found disseminated throughout, along with abundant sulfides, though very few metal rimmed chondrules are seen. Polysynthetically twinned pyroxene is abundant. Olivines range from $Fa_{3-7}$ and pyroxenes from $Fs_{1-3}Wo_{1-4}$. The section is heavily weathered. The meteorite is probably a CR2 chondrite, although the extent of aqueous alteration appears to be less than is typical for CR2 chondrites.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| BUC 10942 | Buckley Island | 21407 | 4.2 x 3.3 x 2.6 | 95.448 | L6 Chondrite |

Macroscopic Description: Cecilia Satterwhite

The exterior has black/brown fusion crust and rusty areas. The interior is a dark gray matrix with some oxidation and metal.

Thin Section (,2) Description: Cari Corrigan and Linda Welzenbach

This meteorite is a shock blackened ordinary (L6?) chondrite. There is a linear fabric to the section. Olivine in the section is of composition $Fa_{24-25}$, pyroxenes are $Fs_{20}Wo_{1-2.}$

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| DOM 10534 | Dominion Range | 19180 | 2.0 x 2.0 x 1.5 | 12.98 | L6 Chondrite |

Macroscopic Description: Kathleen McBride

85% of the pitted exterior has brown/black fusion crust. The rusty interior has a crystalline texture and has abundant metal.

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

This meteorite is a shock-veined ordinary chondrite. Olivines in the section are of composition $Fa_{26}$, pyroxenes are $Fs_{21}Wo_2$. The meteorite is an L chondrite of petrologic type 6.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| DOM 10566 | Dominion Range | 21664 | 3.5 x 3.0 x 2.0 | 38.47 | L5 Chondrite |
| DOM 10595 | Dominion Range | 21981 | 3.25 x 2.25 x 2.5 | 35.02 | L5 Chondrite |

Macroscopic Description: Kathleen McBride

The exteriors of these ordinary chondrites have brown/black fusion crust with some oxidation. The steel gray to black matrix has small vugs and metal.

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

These sections are similar enough that one description is sufficient to describe both. Olivines in the sections are of composition $Fa_{25}$, pyroxenes are $Fs_{21}Wo_{2}$. These meteorites are shock blackened L chondrites of petrologic type 5.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| DOM 10597 | Dominion Range | 21796 | 4.0 x 4.0 x 2.5 | 47.51 | L3.8 Chondrite |

Macroscopic Description: Kathleen McBride

50% of the exterior is covered with thin black fusion crust. The rusty black matrix has numerous multicolored chondrules and abundant metal.

Thin Section (,2) Description: Cari Corrigan and Linda Welzenbach

The section exhibits numerous small, well-defined chondrules (up to 1.5 mm) in a black matrix of fine-grained silicates, metal and troilite. Weak shock effects are present. Polysynthetically twinned pyroxene is extremely abundant. The meteorite is moderately weathered. Silicates are unequilibrated; olivines range from $Fa_{3-41}$, with most grains Fa, and pyroxenes from $Fs_{4-20}Wo_{0-2}$. The meteorite is an L3 chondrite (estimated subtype 3.8).

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| LAP 10060 | LaPaz Ice Field | 22983 | 4.5 x 3.0 x 1.5 | 30.97 | Howardite |

Macroscopic Description: Kathleen McBride

The brown/black exterior surface has a shiny patch of fusion crust. The gray matrix has low metal and white and dark gray clasts.

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

The section shows a groundmass of comminuted pyroxene and plagioclase (10-20 microns) with large diogenitic and eucritic grain fragments up to 200 micron, as well as 100-200 micron troilite and metal blebs. One particularly large (3 x 5 mm) bleb of troilite makes up ~20% of the section. Pyroxene compositions range from $Fs_{24-60}Wo_{2-6}$. Plagioclase is $An_{86-99}Or_{0-1}$. The Fe/Mn ratio of this meteorite is 26-30, with one outlier at 36. This meteorite is either a metal rich howardite or a silicate clast separated from a mesosiderite.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| LAP 10130 | LaPaz Ice Field | 22868 | 7.0 x 6.3 x 3.0 | 352.6 | EL6 Chondrite |

Macroscopic Description: Cecilia Satterwhite

The heavily rusted exterior has brown/black fusion crust with oxidation haloes and evaporites. The bluish gray matrix has minor oxidation and no visible metal or inclusion/chondrules.

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

Only vague traces of chondritic structure are visible in the thin section, which shows the meteorite to consist largely of prismatic or granular enstatite (grain size 0.1-0.2 mm), a considerable amount of nickel-iron, and minor amounts of sulfides and plagioclase. The meteorite is mildly weathered. Microprobe analyses show that the enstatite is almost pure $MgSiO_3$ (FeO 0.1-0.3%); on average, the nickel-iron contains 0.9% Si. The meteorite is an EL6 chondrite.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| PAT 10308 | Patuxent Range | 22413 | 1.0 x 0.8 x 0.4 | 1.145 | L5 Chondrite |

Macroscopic Description: Cecilia Satterwhite

The exterior has brown/black fusion crust with oxidation haloes. The interior is dark gray to black matrix with some lighter gray areas with rusty oxidation and a large piece of metal.

Thin Section (,2) Description: Cari Corrigan, and Linda Welzenbach

This meteorite is an L5 chondrite, but most of the section (~60%) is a large piece of Fe-Ni metal. Olivine compositions are $Fa_{24-27}$ and pyroxenes are $Fs_{20}Wo_{1}$.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11041 | Miller Range | 23889 | 3.5 x 3.0 x 2.5 | 41.98 | Eucrite (Brecciated) |
| MIL 11291 | Miller Range | 22844 | 5.4 x 5.0 x 2.5 | 102.118 | Eucrite (Brecciated) |

Macroscopic Description: Cecilia Satterwhite

The exteriors have shiny black fractured fusion crust. Areas without fusion crust are a dark gray with some black grains and white inclusion. The interiors are light to medium gray matrix and have abundant small black grains and white inclusions.

Thin Section (,2) Description: Cari Corrigan, and Andrew Beck

These meteorites are dominated by fragments of fine-grained basaltic material, with grains ranging from ~50-150 microns, set in a matrix of comminuted pyroxene. A large basaltic clast (4 mm x 5 mm) makes up approximately 30% of the MIL 11291 section. In this clast, the pyroxene and plagioclase grains are both rounded and euhedral and grain sizes are approximately equal. Mineral compositions are homogeneous with orthopyroxene ($Fs_{62}Wo_2$), with lamellae of augite ($Fs_{25}Wo_{45}$), and plagioclase ($An_{87-89}Or_{0-1}$). The Fe/Mn ratio of the pyroxene is ~29-30. These meteorites are brecciated eucrites.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11097 | Miller Range | 22586 | 5.0 x 3.0 x 3.5 | 69.63 | CV3 Chondrite |

Macroscopic Description: Kathleen McBride

50% of the exterior surface has patches of fusion crust, that exhibit polygonal fractures and evaporites. The interior matrix is black with a light gray oxidation rind and light inclusions.

Thin Section (,2) Description: Cari Corrigan

The section exhibits large chondrules (up to 2 mm) and CAIs in a dark matrix. The section is moderately weathered. Olivines range from $Fa_{0-94}$, and pyroxene is $Fs_{48}Wo_{51}$. The meteorite is an unequilibrated carbonaceous chondrite, probably a CV3.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11099 | Miller Range | 22588 | 2.0 x 1.75 x 1.5 | 6.85 | Diogenite |
| MIL 11201 | Miller Range | 21585 | 3.5 x 2.5 x 2.0 | 30.12 | Diogenite |

Macroscopic Description: Kathleen McBride and Cecilia Satterwhite

The exterior surfaces have black patches of fusion crust that are glassy in some areas. The interior matrices are crème/tan colored with crystalline faces. Some yellow oxidation is present. These diogenites have a medium to coarse grained texture.

Thin Section (,2) Description: Cari Corrigan and Andrew Beck

The sections show a groundmass of coarse (up to 1.5 mm) comminuted pyroxene, with minor plagioclase, euhedral chromites (30 microns). Pyroxene compositions are $Fs_{30-48}Wo_{1-4}$ and plagioclase is $An_{87-92}Or_{1}$. The Fe/Mn ratio of the pyroxene is ~28-29. These meteorites exhibit numerous shock features (including pockets of glass). MIL 11197 is less fragmented and the overall grain size is slightly larger, including a large (~2 x 4 mm) chromite grain. These are brecciated diogenites. They are similar enough to suggest pairing with the MIL 090112 group of brecciated diogenites described in the Fall 2012 newsletter.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11197 | Miller Range | 21488 | 3.9 x 3.3 x 1.2 | 39.262 | Diogenite |

Macroscopic Description: Cecilia Satterwhite

70% of the exterior has black patches of fusion crust that are glassy in areas. Areas without fusion crust reveal a tan/crème colored matrix. The interior is a crème/tan colored matrix with some crystalline faces and some yellow oxidation.

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

The section is made up of coarse (up to 1-3 mm) intergrown pyroxene, with minor interstitial plagioclase and euhedral chromites (30 microns). A small amount of exsolution appears in the larger pyroxene grains. Pyroxene compositions are $Fs_{28-29}Wo_{3-5}$ and plagioclase is $An_{88-95}Or_{1}$. The Fe/Mn ratio of the pyroxene is ~26-28. This meteorite is an unbrecciated diogenite.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11292 | Miller Range | 23238 | 4.0 x 3.1 x 2.0 | 40.295 | Eucrite (Brecciated) |

Macroscopic Description: Cecilia Satterwhite

The exterior is covered with black fusion crust that has a glassy appearance in some areas. Areas without fusion crust are a white and gray matrix with small darker grains and evaporites visible. The mottled gray/white matrix has tiny dark gray, black and white mineral grains. Some oxidation is present.

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

This meteorite is dominated by one large coarse-grained eucritic clast (4 mm x 9 mm) that makes up approximately 80% of the section. In this clast, tabular pyroxene grains range up to 4 mm, while plagioclase is more lathe-like, and ~200 microns in size. Small breccia veins with high concentrations of metal, sulfide and eucritic fragments are seen elsewhere in the section. Mineral compositions are homogeneous with orthopyroxene ($Fs_{62}Wo_2$), with lamellae of augite ($Fs_{28}Wo_{36}$), and plagioclase ($An_{87-89}Or_1$). The Fe/Mn ratio of the pyroxene is ~27-32. This meteorite is a brecciated eucrite.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11294 | Miller Range | 22808 | 1.5 x 1.3 x 1.0 | 3.774 | Howardite |

Macroscopic Description: Cecilia Satterwhite

98% of the exterior has black fusion crust with a glassy appearance on some surfaces and one rusty patch. Areas without fusion crust are white to light gray in color. The interior is a gray to tan matrix with light and dark grains, and minor oxidation.

Thin Section (,2) Description: Cari Corrigan and Andrew Beck,

The section shows a groundmass of comminuted pyroxene and plagioclase (up to 0.5 mm, but typically less than 10 microns) with basaltic eucrite clasts ranging up to 3 mm and one diogenitic fragment. Most of the pyroxene is orthopyroxene with compositions ranging from $Fs_{32-60}Wo_{5-36}$ (most $Wo_{2-10}$). Plagioclase is $An_{78-89}Or_{0-2}$. The Fe/Mn ratio of the pyroxene is ~28-32. This meteorite is a howardite.

| Sample No.: | Location: | Field No.: | Dimensions (cm): | Weight (g): | Classification: |
|---|---|---|---|---|---|
| MIL 11296 | Miller Range | 22562 | 5.7 x 3.2 x 2.5 | 74.202 | Howardite |

Macroscopic Description: Cecilia Satterwhite

90% of the exterior has brown/black fusion crust with some gray matrix visible. The interior is a light gray matrix with minor oxidation and small white, gray, black and rusty grains.

Thin Section (,2) Description: Cari Corrigan and Andrew Beck

The section shows a groundmass of comminuted pyroxene and plagioclase (up to 0.5 mm) with large diogenitic pyroxene grains up to 3 mm. The section shows numerous impact features such as glass and sulfide clusters. Most of the pyroxene is orthopyroxene with compositions ranging from $Fs_{15-47}Wo_{2-45}$ (most $Wo_{2-10}$). Plagioclase is $An_{86-94}Or_{0-1}$. The Fe/Mn ratio of the pyroxene is ~28. This meteorite is a howardite.

# 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 **March 8, 2013 deadline** will be reviewed at the MWG meeting on **March 23 in Houston, Texas**. Requests that are received after the deadline may be delayed for review until MWG meets again in the Fall of 2013. 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 and *Meteoritics* and *Meteoritics and Planetary Science* (these are listed in Table 3 of this newsletter. 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/antmet/statistics.cfm**

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

**http://curator.jsc.nasa.gov/antmet/requests.cfm**

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:

JSC-ARES-MeteoriteRequest@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.

## Antarctic Meteorite Laboratory Contact Numbers

Please submit request to: **JSC-ARES-MeteoriteRequest@nasa.gov**

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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://curator.jsc.nasa.gov/antmet/ |
| **JSC Curator, HED Compendium** | http://curator.jsc.nasa.gov/antmet/hed/ |
| **JSC Curator, Lunar Meteorite Compendium** | http://curator.jsc.nasa.gov/antmet/lmc/ |
| **JSC Curator, Mars Meteorite Compendium** | http://curator.jsc.nasa.gov/antmet/mmc/ |
| **ANSMET** | www.case.edu/ansmet |
| **Smithsonian Institution** | http://mineralsciences.si.edu/ |
| **Lunar Planetary Institute** | http://www.lpi.usra.edu |
| **NIPR Antarctic meteorites** | http://www.nipr.ac.jp/ |
| **Meteoritical Bulletin online Database** | http://tin.er.usgs.gov/meteor/metbull.php |
| **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 |
| **Chinese Antarctic meteorite collection** | http://birds.chinare.org.cn/en/yunshiku/ |
| **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://www.meteoritemag.org/ |
| **Geochemical Society** | http://www.geochemsoc.org |
| **Washington Univ. Lunar Meteorite** | http://meteorites.wustl.edu/lunar/moon_meteorites.htm |
| **Washington Univ. "meteor-wrong"** | http://meteorites.wustl.edu/meteorwrongs/meteorwrongs.htm |

## Other Websites of Interest

| | |
|---|---|
| **OSIRIS-REx** | http://osiris-rex.lpl.arizona.edu/ |
| **Mars Exploration** | http://mars.jpl.nasa.gov |
| **Rovers** | http://marsrovers.jpl.nasa.gov/home/ |
| **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://curator.jsc.nasa.gov/ |