Antarctic Meteorite NEWSLETTER

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

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!!!!!!!! SAMPLE REQUEST DEADLINE: MARCH 28, 1988 (SEE PAGE 2) !!!!!!!!

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SAMPLE-REQUEST GUIDELINES

All sample requests should be made in writing to

Secretary, MWG
SN2/Planetary Materials Branch
NASA/Johnson Space Center
Houston, TX 77058 USA.

Requests that are received by the MWG Secretary before March 28, 1988 will be reviewed at the MWG meeting of April 7-9, 1988 to be held in St. Louis, Mo. Requests that are received after the March 28 deadline may possibly be delayed for review until the MWG meets again in the fall of 1988. PLEASE SUBMIT YOUR REQUESTS ON TIME. Questions pertaining to sample requests can be directed in writing to the above address or can be directed by telephone to (713) 483-3274.

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

Each request should accurately refer to meteorite samples by their respective identification numbers and should provide detailed scientific justification for the 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. Consortium requests should be initialed or countersigned by a member of each group in the consortium. All necessary information should probably be condensable into a one- or two-page letter, although informative attachments (reprints of publications that explain rationale, flow diagrams for analyses, etc.) are welcome.

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 three Smithsonian Contr. Earth Sci.: No. 23, No. 24, No. 26..

NEWS AND INFORMATION

The U.S. Antarctic Meteorite Collection, curated by the Johnson Space Center and the Smithsonian Institution, is growing. The expansion is due to this year's large collection from Antarctica and in part to the transfer of samples from the Chicago Field Museum. The Field Museum has transferred to JSC its samples from the 1976 ANSMET collection. Many of these samples were already part of the collection and are described in Meteoritics (13)2, p.209-226. The transfer includes portions of an iron, a eucrite, an unequilibrated chondrite, and the largest equilibrated chondrite collected by the U.S. program.

The 1987-88 ANSMET Teams recovered approximately 690 new meteorite fragments from the ice. Two parties visited previously searched blue ice fields as well as unexplored fields. One party of 6 worked the ice fields in the Beardmore/Walcott Neve area and found 320 meteorites. The other party of 4 worked in the Elephant Moraine/Allan Hills area recovering about 370 meteorites. One meteorite from the Beardmore Area was found emerging from the ice. It was collected encased in ice and will be preserved in this condition for age dating. Many other exciting specimens were found. Stay tuned!

The Smithsonian Institution anticipates the publication of the next in the series of Smithsonian Contributions to Earth Sciences, Number 28, this summer. It is entitled "Field and Laboratory Investigations of Meteorites From Victoria Land and the Thiel Mountains Region, Antarctica, 1982-1983 and 1983-1984", and is edited by U. Marvin and G. MacPherson. For more information contact Glenn MacPherson, Department of Mineral Sciences, Smithsonian.

A guidebook with the sampling documentation for the Fayetteville meteorite written by Carol Schwarz and Derek Sears will soon be going to press. Anyone with the desire to have this publication should send their request to the Curator's Office.

DESCRIPTIONS OF TWO UNIQUE METEORITES

The last issue of Antarctic Meteorite Newsletter (AMN), 10(2), contained preliminary descriptions of two tiny unique meteorites: ALH85085 is an 11 g chondrite and LEW86010 is a 7 g achondrite. In reviewing requests for allocations of these samples MWG decided to send out thin sections for detailed petrographic study and microbeam analysis, but to postpone allocation of chips for chemical analyses until the results of the thin section studies are available to guide them. The thin sections were distributed to all investigators who requested the samples. Ten abstracts describing these two samples were submitted to the 19th Lunar and Planetary Science Conference and have been designated as special sections of the chondrite and achondrite sessions. MWG expects that the presentations will generate interest in these special meteorites and lead to the formation of consortia to undertake the detailed studies. The following descriptive summaries are based on the abstracts which will soon be published by The

Lunar and Planetary Institute in Lunar and Planetary Science XIX (1988). Readers are referred to the specific abstracts for more information.

Chondrite ALH85085 was tentatively classified as an E3 chondrite by Mason but was shown to be unusual, AMN 10(2). This summary is based upon three more detailed petrographic studies (1-3). Another abstract (4) provides an alternative interpretation to those given in the descriptive abstracts. ALH85085 is an extremely fine-grained stone with similarities to all chondrite classes, but whose overall characteristics make it unique.

Isolated grains of low-Ca pyroxene and olivine constitute the bulk of ALH85085. All told (combining isolated grains and chondrule fragments), low-Ca pyroxene and olivine account for ~63 and 6 vol. %, respectively, of ALH85085. Most olivine ranges in composition from Fo_{95-99}, although the range for chondrules is greater (Fo_{62-99}). Low-Ca pyroxene is observed to be En_{90-99}, with most being En_{95-99}.

Metallic Fe-Ni grains constitute 22 vol. %. These grains, predominantly kamacite, range up to ~350 um across, with a mean of only ~20 um. They have maximum concentrations of only 0.5 wt % Co, Cr and P, and mean concentrations of 2.6-12 % Ni. Most metal grains have concentrations of Si below 0.5 wt %, although three grains were found to contain more (up to 7.5 wt %). Troilite, pentlandite and heazelwoodite are present but rare (0.5 vol. %). Chondrules and apparent chondrule fragments account for about 10 vol. % of the sections analyzed, and range in size from ~3 to 400 um with a mean of ~20 um. These chondrule sizes are smaller than those observed in any other chondrite, with the exception of a microchondrule in Piancaldoli. All typical chondrule types are present in ALH85085, but in unusual proportions. Chondrules in ALH85085 are predominantly radial pyroxene or cryptocrystalline, as compared to porphyritic in most chondrites. Ca-Al-rich inclusions (CAI) compose ~0.1 vol. % of ALH85085, with individuals measuring from 14 to 107 um and a mean of ~40 um. The CAI in ALH85085 are very fine-grained and typically melilite-rich, also containing spinel, hibonite and perovskite. Several CAI were observed to contain $CaAl_4O_7$. Fine-grained dark clasts measuring up to 200 um and interstitial matrix constitute ~5 % of ALH85085. Some of these clasts show a resemblance to CIs in that they contain fine-grained framboids, platelets, spherulites and isolated crystals of magnetite, abundant sulfides, olivine, and small amounts of phosphates and carbonates. Other dark clasts are composed of Fe-Mg phyllosilicates, resembling CM matrix.

ALH85085 is unique because it is 1) finer-grained than any other chondrule-bearing chondrite, 2) metal-rich, 3) sulfide deficient, 4) deficient in chondrules and chondrule fragments and 5) rich in fine-grained silicates. It contains fine-grained CAIs, and CI- and CM-like dark inclusions. ALH85085 is nearly as pyroxene-rich as enstatite chondrites, but is much more oxidized. The CAI population is far greater than observed for ordinary chondrites. Many of the mineralogical characteristics suggest affinities to the carbonaceous chondrites, but not to any single type. ALH85085 is therefore a unique chondrite.

Achondrite LEW86010 was described by Mason in AMN 10(2) as a unique achondrite with mineral compositions similar to those of Angra dos Reis (ADOR). This summary is based on four more detailed petrographic studies (5-

8), an experimental study (9), and an ion probe study of REE in individual minerals (10). The meteorite is a coarse-grained granular rock consisting of olivine, pyroxene, and plagioclase each ranging up to about 2.5 mm in size. The texture is igneous, with little metamorphic equilibration, but it is unclear whether it represents any crystal accumulation. Modal proportions vary somewhat in different thin sections: pyroxene ranges from 43 to 60%; plagioclase ranges from 20 to 32%; olivine ranges from 20 to 23%. Accessory minerals include hercynite, troilite, FeNi metal, merrillite and magnetite. The detailed microprobe studies confirm the unusually Ca- and Al-rich mineral compositions noted by Mason (AMN 10(2)). Plagioclase is An_{100} (0.5% FeO), while olivine is Fo_{32} (2% CaO) with exsolution lamallae of kirschsteinite ($La_{45}Fo_{13}Fa_{42}$). Fassaitic pyroxene shows pronounced zonation ranging from $CaTs_9Wo_{42}En_{35}Fs_{13}$ to $CaTs_{28}Wo_{31}En_{20}Fs_{17}$. Decreases in molar Mg/(Mg + Fe) from 0.75 to 0.50, and Cr_2O_3 from 0.7 to 0.1% are accompanied by increases in Al_2O_3 from 6 to 12%, and TiO_2 from 1 to 3%. The pattern of zonation is sometimes regular from core to rim, but sometimes unrelated to grain boundaries. Inclusions of each of the major minerals occur within grains of the others, and the crystallization sequence is uncertain, but textural evidence suggests that the three major phases crystallized simultaneously during most of the crystallization history.

The bulk composition of LEW86010 was calculated from the modal proportions and mineral compositions. This composition varies somewhat due to modal variations, but averages 42% SiO_2, 0.8% TiO_2, 13% Al_2O_3, 17%FeO, 8% MgO, 17% CaO. The petrologic implication that the bulk composition is near the multiple saturation point is confirmed by the experimental study. Liquids slightly enriched in plagioclase and olivine relative to bulk LEW86010 crystallized small amounts of these minerals before arriving at the three phase boundary. The similarity between natural and synthetic mineral compositions supports a magmatic origin. REE partitioning among the individual phases also supports a magmatic origin. REE concentrations in each phase are moderately high due to the Ca-rich nature of the phases, but the patterns are consistent with those of the same minerals in achondritic and terrestrial igneous rocks. REE concentrations in the pyroxene vary by an order of magnitude, and correlate very well with major element variations. This is strong evidence for an igneous origin.

Comparison of LEW86010 with ADOR shows that although there are strong similarities between the two rocks, there are also significant differences. ADOR has a recrystallized texture, while LEW86010 has an igneous texture. Modal proportions and mineral compositions differ between the two rocks: ADOR has 90% pyroxene of uniform composition, some olivine, and rare plagioclase (An_{86}). Both pyroxene and olivine compositions are more magnesian than in LEW86010. REE partitioning between pyroxene and merrillite are distinct in the two samples. Although these two meteorites were probably formed by similar processes from similar parent materials, their magmatic evolutions are distinct. All of the studies conclude that the textures and mineral compositions of LEW86010 indicate that it crystallized from a melt that is very refractory and rich in Ca, Al, and Fe, but poor in Si, Mg, and volatiles. Two of the studies consider the origin of that melt to be distinct from those of other achondrites which are partial melts of chondritic material. The composition of LEW86010 is similar to that of a mixture of CAIs and chondritic material.

(1) J.N. Grossman, A.E. Rubin, and G.J. MacPherson, Allan Hills 85085: An Out-Of-The-Ordinary, Enstatite-Rich Carbonaceous Chondrite.
(2) E.R.D. Scott, A New Kind of Primitive Chondrite: Allan Hills 85085.
(3) M.K. Weisberg, M. Prinz, C.E. Nehru, ALH85085: A Unique Unequilibrated Chondrite.
(4) J.T. Wasson, A Non-Nebular Origin for the Allan Hills 85085 Subchondritic Meteorite.
(5) C.A. Goodrich, Petrology of Unique Achondrite LEW86010.
(6) M. Prinz, M.K. Weisberg, and C.E. Nehru, LEW86010, A Second Angrite: Relationship to CAI's and Opaque Matrix.
(7) J.S. Delanay and S.R. Sutton, Lewis Cliff 86010, an ADORable Antarctican.
(8) G. McKay, D. Lindstrom, S.-R. Yang, and J. Wagstaff, Petrology of Unique Achondrite Lewis Cliff 86010.
(9) G. McKay, D. Lindstrom, L. Le, and S.-R. Yang, Experimental Studies of Synthetic LEW86010 Analogs: Petrogenesis of a Unique Achondrite.
(10) G. Crozaz, L.L. Lundberg, and G. McKay, Rare Earth Elements (REE) in Unique Achondrite LEW86010.

NEW METEORITES FROM 1984-1986 COLLECTIONS

Pages 9-21 contain preliminary descriptions and classifications of meteorites that were completed since publication of issue 10(2) (August, 1987). Some large (>150g) specimens (regardless of petrologic type) and all "pebble"- sized (<150g) specimens of special petrologic type (carbonaceous chondrite, unequilibrated ordinary chondrite, achondrite, etc.) are represented by separate descriptions. However, some specimens of non-special petrologic type are listed only as single line entries in Table 1. For convenience, new specimens are also recast by petrologic type 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 micro-probe analyses using polished sections prepared from a small chip of each meteorite. For each stony meteorite the sample number assigned to the preliminary examination section is included. In some cases, however, a single microscopic description was based on thin sections of several specimens believed to be members of a single fall.

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

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Antarctic Meteorite Locations

ALH - Allan Hills
BOW - Bowden Neve
BTN - Bates Nunatak
DOM - Dominion Range
DRP - Derrick Peak
EET - Elephant Moraine
GEO - Geologist Range
GRO - Grosvenor Mountains
ILD - Inland Forts
LEW - Lewis Cliff
MBR - Mount Baldr
MET - Meteorite Hills
MIL - Miller Range
OTT - Outpost Nunatak
QUE - Queen Alexandra Range
PCA - Pecora Escarpment
PGP - Purgatory Peak
RKP - Reckling Peak
TIL - Thiel Mountains
TYR - Taylor Glacier

** 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.

"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.

Table 1.

List of Newly Classified Antarctic Meteorites **

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
ALH 84175	35.4	H-5 CHONDRITE	C	B	19	16
ALH 84176	4.6	H-6 CHONDRITE	C	B/C	18	16
ALH 84179	46.5	H-5 CHONDRITE	B/C	B/C	18	16
ALH 84180	47.4	H-6 CHONDRITE	B	A	18	16
ALH 84182	14.2	L-6 CHONDRITE	B	B	24	21
ALH 84183	27.8	H-5 CHONDRITE	B	B	17	15
ALH 84187	25.9	H-6 CHONDRITE	C	B/C	18	16
ALH 84190	7.9	ACHONDRITE (UNIQUE)	C	B	4	6
ALH 84192	4.2	H-5 CHONDRITE	C	A	18	16
ALH 84194	3.9	H-5 CHONDRITE	C	A/B	18	16
ALH 84195	2.1	L-4 CHONDRITE	B	A	22	15-20
ALH 84196	10.2	H-5 CHONDRITE	B/C	A	18	16
ALH 84199	27.1	H-5 CHONDRITE	C	A	17	15
ALH 84200	8.5	E-4 CHONDRITE	B	B		0.6-4
ALH 84201	6.3	H-5 CHONDRITE	B/C	A	18	16
ALH 84202	87.5	H-5 CHONDRITE	C	B	17	15
ALH 84205	25.2	L-3 CHONDRITE	B	B	12-33	4-19
ALH 84208	20.9	H-6 CHONDRITE	C	B	17	15
ALH 84209	5.5	L-5 CHONDRITE	C	A/B	23	20
ALH 84211	49.2	H-6 CHONDRITE	B/C	A	19	17
ALH 84213	6.7	H-5 CHONDRITE	B	A	18	16
ALH 84215	9.2	H-6 CHONDRITE	B/C	A	18	16
ALH 84217	2.7	H-5 CHONDRITE	C	A	18	16
ALH 84220	8.4	E-4 CHONDRITE	C	B		1-4
ALH 84221	16.4	H-5 CHONDRITE	C	A	18	16
ALH 84222	9.9	H-5 CHONDRITE	C	A	19	17
ALH 84223	10.6	H-5 CHONDRITE	C	A	18	16
ALH 84224	7.2	H-6 CHONDRITE	B	A/B	18	16
ALH 84225	8.7	H-5 CHONDRITE	C	B	18	16
ALH 84226	27.6	H-5 CHONDRITE	B	A	17	15
ALH 84228	9.8	H-5 CHONDRITE	B/C	B	18	16
ALH 84232	9.9	H-4 CHONDRITE	C	B	17	14-20
ALH 84235	6.0	E-4 CHONDRITE	C	B/C		.5-2.3
ALH 84237	7.5	H-5 CHONDRITE	C	B	17	15
ALH 84239	14.7	H-5 CHONDRITE	B	A	18	16
ALH 84240	25.9	H-5 CHONDRITE	C	A	18	16
ALH 84241	16.7	H-5 CHONDRITE	C	B	17	15
ALH 84242	16.9	H-6 CHONDRITE	C	B	19	17
ALH 84246	1.8	H-5 CHONDRITE	A/B	B	18	16
ALH 84248	4.9	H-5 CHONDRITE	B	B	19	16
ALH 84249	23.4	H-5 CHONDRITE	B/C	A/B	18	16
ALH 84251	34.3	H-5 CHONDRITE	B/C	B	18	16
ALH 84253	7.1	H-5 CHONDRITE	B/C	A	18	16
ALH 84258	2.6	L-5 CHONDRITE	B	A	25	21
ALH 84259	23.1	H-5 CHONDRITE	C	B/C	18	16
ALH 84260	14.6	H-5 CHONDRITE	B	A	19	16
ALH 84263	4.6	H-5 CHONDRITE	C	A	18	16

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LEW 85313 #	191.2	HOWARDITE	B	B		15-64
ALH 86600	411.1	L-6 CHONDRITE	B	B	24	21
ALH 86601	309.0	H-5 CHONDRITE	B	B/C	18	16
ALH 86602	264.5	L-6 CHONDRITE	B	A	24	20
EET 86800 ~	116.0	L-6 CHONDRITE	A	B/C		
EET 86801	82.9	L-6 CHONDRITE	B	A	24	21
EET 86802	29.6	H-4 CHONDRITE	A	B/C	18	13-17
LEW 86011	3397.5	L-6 CHONDRITE	A/B	A	25	21
LEW 86012	2157.4	L-6 CHONDRITE	A	B/C	25	21
LEW 86013	1812.2	L-6 CHONDRITE	B	B	25	21
LEW 86014	662.4	L-4 CHONDRITE	C	A	24	17-22
LEW 86015	780.1	H-6 CHONDRITE	C	B/C	19	17
LEW 86016	525.0	L-6 CHONDRITE	A/B	A/B	25	21
LEW 86017	687.6	H-6 CHONDRITE	B	A/B	19	16
LEW 86019	432.4	L-6 CHONDRITE	B	A/B	24	20
LEW 86020	360.5	H-5 CHONDRITE	C	B	18	16
LEW 86021	325.8	L-3 CHONDRITE	C	A	18-28	4-17
LEW 86022	351.7	L-3 CHONDRITE	B/C	B	6-34	1-31
LEW 86023	322.0	L-6 CHONDRITE	B	A	23	20
LEW 86024	248.5	L-4 CHONDRITE	A/B	A	22	19
LEW 86025	190.1	L-6 CHONDRITE	C	B	23	20
LEW 86026	22.1	H-5 CHONDRITE	B/C	A	18	16
LEW 86028	25.9	H-6 CHONDRITE	B	A	18	16
LEW 86029	16.5	H-5 CHONDRITE	C	A	18	16
LEW 86030	13.4	H-6 CHONDRITE	C	A	18	16
LEW 86031	74.5	H-5 CHONDRITE	C	A/B	19	16
LEW 86032	1.4	H-5 CHONDRITE	B/C	A	18	16
LEW 86033	21.5	H-4 CHONDRITE	B/C	A	18	15-17
LEW 86034	6.0	L-4 CHONDRITE	C	A	25	21-23
LEW 86035	77.7	H-5 CHONDRITE	B/C	B	19	16
LEW 86036	9.3	H-5 CHONDRITE	B/C	A	18	16
LEW 86037	5.6	H-5 CHONDRITE	B/C	A	19	16
LEW 86038 ~	18.8	L-6 CHONDRITE	C	A/B		
LEW 86039	41.5	H-5 CHONDRITE	B/C	A	19	16
LEW 86040	48.8	L-4 CHONDRITE	C	A	23	19
LEW 86041	22.5	H-5 CHONDRITE	B/C	A	17	15
LEW 86042	5.4	L-6 CHONDRITE	B	B	24	21
LEW 86043	13.5	L-6 CHONDRITE	B/C	A	25	21
LEW 86044	18.8	H-5 CHONDRITE	C	A	18	16
LEW 86045	5.4	H-5 CHONDRITE	C	B	18	16
LEW 86046	4.6	H-5 CHONDRITE	C	B	18	16
LEW 86047	68.7	H-5 CHONDRITE	C	B	18	16
LEW 86048 ~	6.3	L-6 CHONDRITE	C	B		
LEW 86049	14.8	H-5 CHONDRITE	C	B	18	16
LEW 86050	10.6	H-5 CHONDRITE	B/C	A	18	16
LEW 86051	2.0	H-5 CHONDRITE	B/C	A	18	16
LEW 86054 ~	2.4	L-6 CHONDRITE	B/C	A		
LEW 86056 ~	6.8	L-6 CHONDRITE	B/C	A		
LEW 86057 ~	54.7	LL-6 CHONDRITE	B/C	A		

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LEW 86064 ~	24.3	L-6 CHONDRITE	C	A		
LEW 86066 ~	18.5	H-6 CHONDRITE	C	B		
LEW 86069 ~	0.6	LL-6 CHONDRITE	C	A		
LEW 86070 ~	19.2	LL-6 CHONDRITE	A/B	A/B		
LEW 86073 ~	37.7	L-6 CHONDRITE	B/C	A		
LEW 86075 ~	4.5	L-6 CHONDRITE	B/C	A		
LEW 86082 ~	8.3	LL-6 CHONDRITE	B	A		
LEW 86084 ~	53.1	L-6 CHONDRITE	C	A		
LEW 86085 ~	196.9	L-6 CHONDRITE	C	A		
LEW 86090 ~	23.2	L-6 CHONDRITE	C	A		
LEW 86097 ~	2.5	L-6 CHONDRITE	C	B		
LEW 86101 ~	28.5	LL-6 CHONDRITE	B	A		
LEW 86110 ~	33.7	L-6 CHONDRITE	C	A		
LEW 86113 ~	6.8	L-6 CHONDRITE	B/C	A		
LEW 86115 ~	33.5	L-6 CHONDRITE	C	A		
LEW 86117 ~	13.5	LL-6 CHONDRITE	B	A		
LEW 86120 ~	32.9	H-6 CHONDRITE	C	A		
LEW 86123	11.5	H-4 CHONDRITE	B/C	A	19	10-21
LEW 86127	11.9	L-3 CHONDRITE	B	A	2-26	2-17
LEW 86132 ~	12.1	L-6 CHONDRITE	C	A/B		
LEW 86133 ~	8.3	L-6 CHONDRITE	A	A		
LEW 86134	28.9	L-3 CHONDRITE	B/C	A/B	2-24	1-20
LEW 86135 ~	10.0	L-6 CHONDRITE	C	A		
LEW 86137 ~	6.5	H-6 CHONDRITE	C	A		
LEW 86139 ~	3.8	H-6 CHONDRITE	C	A		
LEW 86140 ~	9.4	L-6 CHONDRITE	B	A		
LEW 86141 ~	4.7	L-6 CHONDRITE	C	A		
LEW 86144	11.1	L-3 CHONDRITE	B/C	A/B	1-25	2-16
LEW 86158	8.6	L-3 CHONDRITE	B	A	5-25	5-20
LEW 86160 ~	15.4	H-6 CHONDRITE	C	A		
LEW 86161 ~	29.0	LL-6 CHONDRITE	B	A		
LEW 86162 ~	2.2	LL-6 CHONDRITE	A	A		
LEW 86163 ~	15.4	H-6 CHONDRITE	C	A		
LEW 86165	18.2	H-4 CHONDRITE	C	A	18	16
LEW 86166 ~	20.7	L-6 CHONDRITE	C	A		
LEW 86168 ~	18.3	H-6 CHONDRITE	C	A		
LEW 86169 ~	25.8	L-6 CHONDRITE	B/C	A		
LEW 86170 ~	4.2	H-6 CHONDRITE	B/C	A/B		
LEW 86173 ~	1.8	L-6 CHONDRITE	C	A		
LEW 86175 ~	2.4	L-6 CHONDRITE	B	A/B		
LEW 86178 ~	13.5	H-6 CHONDRITE	C	A		
LEW 86179 ~	5.4	L-6 CHONDRITE	B/C	A		
LEW 86182 ~	18.8	H-6 CHONDRITE	C	A		
LEW 86183 ~	22.9	H-6 CHONDRITE	C	A		
LEW 86186 ~	47.5	L-6 CHONDRITE	C	B		
LEW 86188	6.1	H-5 CHONDRITE	C	B/C	18	16
LEW 86190 ~	28.4	H-6 CHONDRITE	C	B		
LEW 86193 ~	7.6	L-6 CHONDRITE	C	A		
LEW 86195 ~	41.5	L-6 CHONDRITE	A/B	A		
LEW 86196 ~	18.5	H-6 CHONDRITE	B/C	A		
LEW 86201 ~	18.2	H-6 CHONDRITE	C	A		
LEW 86203 ~	61.4	L-6 CHONDRITE	B/C	A		

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
LEW 86204 ~	22.5	H-6 CHONDRITE	C	A		
LEW 86205 ~	17.4	H-6 CHONDRITE	C	A/B		
LEW 86207	17.7	L-3 CHONDRITE	C	A/B	1-25	2-21
LEW 86210	9.2	MESOSIDERITE	C	A	45	24-61
LEW 86212 ~	5.5	H-6 CHONDRITE	C	A		
LEW 86216	6.5	UREILITE	C	A	12-20	12-18
LEW 86218 ~	6.2	H-6 CHONDRITE	C	A		
LEW 86220	25.0	IRON			7	9
LEW 86221 ~	17.6	H-6 CHONDRITE	C	A		
LEW 86231 ~	18.2	L-6 CHONDRITE	B/C	A		
LEW 86236 ~	1.5	H-6 CHONDRITE	C	A		
LEW 86238 ~	28.9	L-6 CHONDRITE	B	A/B		
LEW 86239 ~	25.4	H-6 CHONDRITE	C	B		
LEW 86246	2.3	L-3 CHONDRITE	C	A	1-29	2-18
LEW 86252 ~	32.9	H-6 CHONDRITE	C	A		
LEW 86253 ~	10.1	H-6 CHONDRITE	B/C	A		
LEW 86258	24.1	CARBONACEOUS C4	B	A	29	5
LEW 86268 ~	22.0	L-6 CHONDRITE	B/C	A		
LEW 86269 ~	22.4	L-6 CHONDRITE	C	A		
LEW 86270	4.2	L-3 CHONDRITE	B/C	B	0.6-28	0.4-19
LEW 86274 ~	36.0	L-6 CHONDRITE	B/C	A		
LEW 86282 ~	62.4	L-6 CHONDRITE	B	A		
LEW 86287 ~	41.5	H-6 CHONDRITE	C	A/B		
LEW 86288 ~	10.8	L-6 CHONDRITE	C	A		
LEW 86289 ~	17.6	L-6 CHONDRITE	B/C	B		
LEW 86295 ~	43.8	H-6 CHONDRITE	B	A		
LEW 86309 ~	13.8	L-6 CHONDRITE	B	B		
LEW 86311 ~	67.1	L-6 CHONDRITE	B	A		
LEW 86317 ~	62.4	L-6 CHONDRITE	B	A		
LEW 86328 ~	7.2	H-6 CHONDRITE	C	A		
LEW 86330 ~	20.7	L-6 CHONDRITE	C	A		
LEW 86333 ~	9.2	H-6 CHONDRITE	C	A		
LEW 86335 ~	3.1	H-6 CHONDRITE	C	A		
LEW 86340 ~	25.1	H-6 CHONDRITE	C	A		
LEW 86342 ~	2.4	H-6 CHONDRITE	C	A		
LEW 86343 ~	6.3	H-6 CHONDRITE	C	A		
RKP 86700	424.1	L-3 CHONDRITE	B	B	17-27	14-23
RKP 86701	176.8	H-6 CHONDRITE	B	A	18	16
RKP 86702	195.2	L-6 CHONDRITE	C	A/B	24	20
RKP 86703	196.0	H-6 CHONDRITE	C	B/C	19	17
RKP 86704 ~	137.9	LL-6 CHONDRITE	B/C	A		
RKP 86705	68.5	H-5 CHONDRITE	B	C	18	16

Table 2.
Newly Classified Specimens Listed By Type **

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
		Achondrites				
ALH 84190	7.9	ACHONDRITE (UNIQUE)	C	B	4	6
LEW 85313 #	191.2	HOWARDITE	B	B		15-64
LEW 86216	6.5	UREILITE	C	A	12-20	12-18
		Carbonaceous Chondrites				
LEW 86258	24.1	CARBONACEOUS C4	B	A	29	5
		E Chondrites				
ALH 84200	8.5	E-4 CHONDRITE	B	B		0.6-4
ALH 84220	8.4	E-4 CHONDRITE	C	B		1-4
ALH 84235	6.0	E-4 CHONDRITE	C	B/C		.5-2.3
		Chondrites - Type 3				
ALH 84205	25.2	L-3 CHONDRITE	B	B	12-33	4-19
LEW 86021	325.8	L-3 CHONDRITE	C	A	18-28	4-17
LEW 86022	351.7	L-3 CHONDRITE	B/C	B	6-34	1-31
LEW 86127	11.9	L-3 CHONDRITE	B	A	2-26	2-17
LEW 86134	28.9	L-3 CHONDRITE	B/C	A/B	2-24	1-20
LEW 86144	11.1	L-3 CHONDRITE	B/C	A/B	1-25	2-16
LEW 86158	8.6	L-3 CHONDRITE	B	A	5-25	5-20
LEW 86207	17.7	L-3 CHONDRITE	C	A/B	1-25	2-21
LEW 86246	2.3	L-3 CHONDRITE	C	A	1-29	2-18
LEW 86270	4.2	L-3 CHONDRITE	B/C	B	0.6-28	0.4-19
RKP 86700	424.1	L-3 CHONDRITE	B	B	17-27	14-23
		Irons				
LEW 86220	25.0	IRON			7	9
		Stony-Irons				
LEW 86210	9.2	MESOSIDERITE	C	A	45	24-61

~ Classified by using refractive indices.
# Reclassified.

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).

TABLE 3.

TENTATIVE PAIRINGS FOR NEW SPECIMENS

ACHONDRITE (UNIQUE):
ALH84190 with ALHA81187.

HOWARDITE:
LEW85313 with LEW85441.

E-4 CHONDRITE:
ALH84200, 84220, 84235 with ALH82132.

L-3 CHONDRITE:
LEW86127, 86134, 86144, 86158, 86207, and 86246.

LEW86022 with LEW85396.

RKP86700 with RKPA80256.

Sample No.: ALH84190
Weight (g): 7.9
Dimensions (cm): 3x1.5x1
Meteorite Type: Achondrite (unique)

Location: Allan Hills
Field No.: 2490

Macroscopic Description: Roberta Score
This specimen probably fits on a corner of a larger meteorite that is angular and has an ablation flange. The interior material is extensively weathered; any features present are disguised by oxidation.

Thin Section (,2) Description: Brian Mason
The section shows an aggregate of anhedral to subhedral grains, 0.06-0.5 mm across, of olivine and pyroxene, with about 15% of disseminated nickel-iron and minor amounts of plagioclase and troilite. The proportion of pyroxene to olivine is estimated as 4:1. Weathering is extensive, with veinlets and small areas of brown limonite throughout the section. Microprobe analyses give the following compositions: olivine, Fa_4; plagioclase, An_{19}; pyroxene, Wo_3Fs_6 (slightly variable) with one grain of diopside, $Wo_{43}Fs_3$, analysed. The meteorite is essentially identical with ALHA81187, which was considered to be an unique achondrite; in mineral compositions and texture these meteorites closely resemble inclusions in iron meteorites, such as in Campo del Cielo (Wlotzka and Jarosewich, Smithsonian Contrib. Earth Sci., No. 19, p. 104, 1977).

Sample No.: ALH84200; 84220; 84235
Weight (g): 8.5; 8.4; 6.0
Dimensions (cm): 3x1x1; 2x1.5x1.5; 2x2x0.8
Meteorite Type: E4 Chondrite

Location: Allan Hills
Field No.: 2538;2504;2378

Macroscopic Description: Roberta Score
Very little fusion crust remains on these fragments. Part of ALH84200 is extensively oxidized and crumbles easily when handled. Other areas are black and contain inclusions that are <1 mm in size. ALH84220 and 84235 are extremely weathered; no features are visible.

Thin Section (ALH84200,2; 84220,2; 84235,2) Description: Brian Mason
These meteorites are identical in all respects and are probably paired. Chondrules and chondrule fragments are abundant, but are usually small (ranging up to 0.6 mm across, although a few are larger); they consist of fine-grained to coarsely granular pyroxene. The matrix consists of small pyroxene grains and opaque material (mostly nickel-iron with some sulfides). The meteorites are considerably weathered, with brown limonitic staining throughout the sections. Microprobe analyses show pyroxene compositions ranging from $Fs_{0.6}$ to $Fs_{4.0}$, with a mean of $Fs_{1.8}$. The nickel-iron contains 2.3% Si. The meteorites are enstatite chondrites, and since most of the pyroxene is polysynthetically twinned clinoenstatite, they are classified E4. They closely resemble ALH84254, ALH82132, and some other ALH E4 chondrites, and the possibility of pairing should be considered.

Sample No.: ALH84205
Weight (g): 25.2
Dimensions (cm): 3x2.5x2
Meteorite Type: L3 Chondrite

Location: Allan Hills
Field No.: 2830

Macroscopic Description: Roberta Score
Fusion crust covers 60% of ALH84205. The interior is made up of light to medium gray matrix with abundant light and dark inclusions/chondrules.

Thin Section (,2) Description: Brian Mason
Chondrules and chondrule fragments are abundant, ranging up to 2.1 mm across; most are granular olivine and olivine-pyroxene, but barred olivine and cryptocrystalline pyroxene chondrules are also present. Many have narrow black rims. Nickel-iron and troilite are present in small amounts. Microprobe analyses show olivine ranging in composition from Fa_{12} to Fa_{33}, with a mean of Fa_{19} (CV FeO is 27); pyroxene composition ranges from Fs_4 to Fs_{19}. The meteorite is classified as an L3 chondrite (estimated L3.7).

Sample No.: LEW85313
Weight (g): 191.2
Dimensions (cm): 8x5.5x4.5
Meteorite Type: Reclassification from diogenite to howardite

Macroscopic Description: Roberta Score
Dull fusion crust covers most of LEW85313 except where large pieces of stone have been plucked out. This feature is abundant and makes this meteorite resemble a piece of Swiss cheese. A brownish-gray weathering rind extends from less than 1 mm to greater than 1 cm into the interior. The massive gray matrix contains both rounded and irregular inclusions that range in color from white to black. Some oxidation haloes are obvious.

Thin Section (,21) Description: Brian Mason
LEW85313 was originally classified as a diogenite on the basis of section 85313,5 (Antarctic Meteorite Newsletter 9, #3, p. 22). Jack Berkley suggested this sample should be reclassified and a new section was made which shows that the meteorite is a howardite, the original section was of an unusually large diogenite clast. LEW85313,21 is a microbreccia of pyroxene clasts (orthopyroxene with minor pigeonite), up to 0.9 mm across, in a comminuted groundmass of pyroxene grains, with minor plagioclase and accessory opaques (troilite and nickel-iron). Microprobe analyses show the following range in pyroxene compositions: $Wo_{1-10}Fs_{15-64}En_{34-85}$, with a mean of Wo_8Fs_{33} (one grain of ferroaugite, $Wo_{37}Fs_{38}$, was analysed). Plagioclase composition range is An_{78-94}. Two grains of a silica polymorph, probably tridymite, were analysed. This meteorite is similar to LEW85441 (Antarctic Meteorite Newsletter 10, #1, p. 17), and the possibility of pairing should be considered.

Sample No.: LEW86014
Weight (g): 662.4
Dimensions (cm): 13.5x9.5x4
Meteorite Type: L4 Chondrite

Location: Lewis Cliff
Field No.: 3252

Macroscopic Description: Roberta Score
This flat chondrite fragment has thin fusion crust on 50% of its exterior surface. The areas devoid of fusion crust are red-brown in color. A few chondrules are discernable in the extensively weathered interior. This stone was extremely difficult to break despite its flat shape!

Thin Section (,4) Description: Brian Mason
Most of the section consists of a close-packed aggregate of chondrules with minor amounts of nickel-iron and troilite, but it contains an elliptical polycrystalline inclusion (5x3 mm) made up of polysynthetically twinned clinopyroxene, olivine, minor plagioclase, and one large grain of merrillite. Chondrules range up to 1.5 mm across, and show a variety of types: granular and porphyritic olivine and olivine-pyroxene, barred olivine, and cryptocrystalline pyroxene. Microprobe analyses of the chondritic portion give the following compositions: olivine, Fa_{24}; pyroxene, Fs_{17-22}. Compositions in the inclusion are olivine, Fa_{23}; pyroxene, Fs_{17}; plagioclase, An_{81}. The meteorite is an L4 chondrite.

Sample No.: LEW86021
Weight (g): 325.8
Dimensions (cm): 6x6.5x4.5
Meteorite Type: L3 Chondrite

Location: Lewis Cliff
Field No.: 2332

Macroscopic Description: Roberta Score
LEW86021 is a rounded specimen that is mostly covered with iridescent fusion crust. Evaporite deposit is present on some exterior surfaces. The interior of LEW86021 is heavily weathered. Large areas of orange oxidation are present in the otherwise red-brown interior. Some evaporite deposit developed on the interior surfaces after the stone dried in a nitrogen cabinet for several hours.

Thin Section (,5) Description: Brian Mason
The section shows a close-packed mass of chondrules (up to 2.7 mm across), chondrule fragments, and irregular crystalline aggregates, together with minor amounts of interstitial nickel-iron and troilite. A variety of chondrule types is present, including granular and porphyritic olivine and olivine-pyroxene, barred olivine, and radiating pyroxene. Weathering is extensive, with limonitic staining and areas of brown limonite throughout the section. Microprobe analyses give the following compositions: olivine, Fa_{18-28}, mean Fa_{21} (CV FeO is 10); pyroxene, Fs_{4-17}. The meteorite is an L3 chondrite (estimated L3.9).

Sample No.:	LEW86022	Location: Lewis Cliff
Weight (g):	351.7	Field No.: 4971
Dimensions (cm):	8.5x5x7	
Meteorite Type:	L3 Chondrite	

Macroscopic Description: Roberta Score
LEW86022 is a weathered chondrite fragment that is highly polished and iridescent, retains 40% of its original fusion crust, and has greenish streaks of oxidation on the exterior surfaces. Abundant inclusions are still obvious in the extensively weathered interior. A minute amount of "salts" is present in the interior.

Thin Section (,4) Description: Brian Mason
The section shows a close-packed mass of chondrules (up to 2.9 mm across), chondrule fragments, and irregular granular aggregates, set in a small amount of opaque matrix which includes minor amounts of nickel-iron and troilite. Most chondrules consist of granular or porphyritic olivine, some with polysynthetically twinned clinopyroxene. Microprobe analyses give the following compositions: olivine, Fa_{6-34}, mean Fa_{18} (CV FeO is 46); pyroxene, Fs_{1-31}. The meteorite is classified as an L3 chondrite (estimated L3.5); it is similar to LEW85396 and 85401, and the possibility of pairing should be considered.

Sample No.:	LEW86127; 86134; 86144; 86158; 86207; 86246	Location: Lewis Cliff
Weight (g):	11.9; 28.9; 11.1; 8.6; 17.7; 2.3	Field No.: 3235;3272;3291; 3248;2341;2355
Dimensions (cm):	2.5x2x1; 3.5x3x1.5; 2.5x2x1.5; 2x1x1.5; 2x2x1.5; 1x1x1	
Meteorite Type:	L3 Chondrite	

Macroscopic Description: Rene Martinez and Cecilia Satterwhite
All of these hand-specimens show light and dark chondrules and angular fragments in contrast with a darker, very coherent matrix. Some of the chondrules are rimmed and range from <1 mm to ~4 mm diameter.

Thin Section (LEW86127,2; 86134,3; 86144,2; 86158,2; 86207,3; 86246,2) Description: Brian Mason
These meteorites are very similar in all respects and are possibly paired. The sections show a close-packed aggregate of chondrules and chondrule fragments, up to 3 mm across, in a minimum amount of fine-grained dark matrix which contains a little nickel-iron and troilite. Chondrule types include granular and porphyritic olivine and olivine-pyroxene, barred olivine, and radiating and cryptocrystalline pyroxene. Weathering is extensive, with brown limonitic staining throughout. Microprobe analyses show olivine and pyroxene with a wide range of composition: olivine, Fa_{1-29}; pyroxene, Fs_{1-21}. The low content of nickel-iron suggests L group, and the wide range of olivine and pyroxene compositions type 3; thus these meteorites are tentatively classified as L3 chondrites (estimated L3.5).

Sample No.: LEW86210
Weight (g): 9.2
Dimensions (cm): 1.5x1.5x1.5
Meteorite Type: Mesosiderite

Location: Lewis Cliff
Field No.: 2306

Macroscopic Description: Cecilia Satterwhite
This pebble is weathered reddish-brown. Interior has very high metallic fraction; 1-2 mm-size tan-colored inclusions are abundant.

Thin Section (,2) Description: Brian Mason
The section consists of a granular aggregate of about 50% nickel-iron, 50% silicates. The silicates are dominantly pyroxene with lesser amounts of plagioclase, as clastic grains up to 1.5 mm in maximum dimension in a matrix of comminuted silicates. Minor weathering is indicated by small areas of brown limonite. Microprobe analyses show pyroxene compositions with a range of $Wo_{2-8}Fs_{24-61}$; most grains are in the range Fs_{24-31}, with a mean of Wo_4Fs_{29}. Plagioclase composition is An_{89-92}. One grain of olivine, Fa_{45}, was analysed. The meteorite is a mesosiderite.

Sample No.: LEW86216
Weight (g): 6.5
Dimensions (cm): 1.5x1.5x1
Meteorite Type: Ureilite

Location: Lewis Cliff
Field No.: 2305

Macroscopic Description: Cecilia Satterwhite
The fusion crust on this specimen is black and frothy on most surfaces. The interior is dark with light-colored inclusions up to ~3 mm.

Thin Section (,2) Description: Brian Mason
The meteorite is extremely weathered, and much of the section is obscured by brown limonite. It shows rounded olivine grains, up to 3 mm across, in a finer-grained, probably comminuted matrix of olivine with minor pyroxene. The probable presence of accessory diamond is indicated by difficulties in cutting and polishing, and by brightly fluorescent particles in an electron beam. The meteorite is heavily shocked, the large olivines being converted into a mosaic of tiny grains averaging 0.05 mm across. Microprobe analyses show olivine composition ranging Fa_{12-18}, with a mean of Fa_{17} (CaO 0.2-0.4%); pyroxene compositions range $Wo_{1-10}Fs_{12-18}$. The meteorite is a ureilite.

Sample No.: LEW86220
Weight (g): 25.0
Dimensions (cm): 4x1x1.5
Meteorite Type: Iron with silicate inclusions

Location: Lewis Cliff
Field No.: 2368

Macroscopic Description: Rene Martinez
This elongated pebble is covered with black fusion crust and at first inspection is inconspicuous. The interior however, is crystalline with what appears to be coarse-grained silicate minerals, some green, some yellow--all of these stained by oxidation. The string-like texture of the metal gives this specimen an unusual look.

Thin Section (.2) Description: Brian Mason
The meteorite consists dominantly of nickel-iron with lesser amounts of silicates, as a granular aggregate with most grains in the 0.3-1.2 mm range. The silicates are olivine and pyroxene with minor plagioclase. The section is veined with brown limonite. Microprobe analyses give the following compositions: olivine, Fa_7; pyroxene, Wo_2Fs_9; plagioclase, An_{15}; one grain of diopside, $Wo_{43}Fs_4$, was analysed. The meteorite is an iron with silicate inclusions.

Sample No.: LEW86258
Weight (g): 24.1
Dimensions (cm): 3.5x3x2
Meteorite Type: C4 Chondrite

Location: Lewis Cliff
Field No.: 2345

Macroscopic Description: Rene Martinez
This specimen is gray and friable with black chondrules protruding from weathered surfaces. About 40% of its exterior surface is covered by polygonally fractured black fusion crust.

Thin Section (.3) Description: Brian Mason
The section shows a few chondrules in a matrix consisting largely of fine-grained olivine (grains ranging up to 0.1 mm), with a little pyroxene, plagioclase, and opaques (the opaques are almost entirely magnetite, with a little fine-grained nickel-iron). Most chondrules are about 1 mm in diameter and consist of granular olivine; one large chondrule, 2.5 mm across, consists of radiating plagioclase laths up to 0.8 mm long in a matrix of granular olivine and diopside. Analyses give the following compositions: olivine, Fa_{29}; diopside, $Wo_{42}Fs_5$ with 4.8% Al_2O_3, 1.9% TiO_2; plagioclase, An_{84-89}. The meteorite is classified as a C4 chondrite.

Sample No.: LEW86270
Weight (g): 4.2
Dimensions (cm): 2x1.5x1
Meteorite Type: L3 Chondrite

Location: Lewis Cliff
Field No.: 2343

Macroscopic Description: Roberta Score
This specimen is highly fractured and has weathered red-brown. Interior is dark with abundant rounded inclusions and is heavily oxidized in some areas.

Thin Section (,2) Description: Brian Mason
The section shows a close-packed aggregate of chondrules and chondrule fragments, up to 4 mm across, in a small amount of dark matrix heavily infiltrated with brown limonite. Accessory amounts of nickel-iron and troilite are present, concentrated on the margins of chondrules. Most of the chondrules are of granular or porphyritic olivine and olivine-pyroxene. One barred chondrule consists of olivine (Fa_{19}), pyroxene ($Wo_{12}Fs_{20}$, with 2.0% Al_2O_3 and 0.4% TiO_2), and plagioclase (An_{92}). Microprobe analyses of the bulk show olivine and pyroxene of variable composition: olivine, $Fa_{0.6-28}$, mean Fa_{14} (CV FeO is 52); pyroxene, $Fs_{0.4-19}$. The low content of nickel-iron suggests L group, and the wide range of olivine and pyroxene compositions type 3, hence the meteorite is tentatively classified as an L3 chondrite (estimated L3.4).

Sample No.: RKP86700
Weight (g): 424.1
Dimensions (cm): 9x5x5
Meteorite Type: L3 Chondrite

Location: Reckling Peak
Field No.: 3403

Macroscopic Description: Rene Martinez
Brown fusion crust which is spotted with oxidation haloes covers 90% of this specimen. The interior surfaces are dark gray with black inclusions as large as 2 mm in diameter. Oxidation is heavy along interior fractures.

Thin Section (,7) Description: Brian Mason
The section shows a close-packed mass of chondrules (0.6-2.4 mm across) and irregular granular aggregates. Some of the chondrules have dark rims consisting largely of fine-grained troilite. The sparse matrix is fine-grained, with a small amount of coarser nickel-iron and troilite scattered throughout. A notable variety of chondrule types is present; many are granular or porphyritic olivine and olivine-pyroxene with transparent to turbid interstitial glass. The pyroxene is polysynthetically twinned clinobronzite. Brown limonitic staining pervades the section. Microprobe analyses show olivine ranging in composition from Fa_{17} to Fa_{27}, with a mean of Fa_{23} (CV FeO is 9.3); pyroxene compositions range from Fs_{14} to Fs_{23}. The meteorite is an L3 chondrite (estimated L3.9); it resembles RKPA80256, and the possibility of pairing should be considered.

Natural Thermoluminescence Data for Antarctic Meteorites

The natural thermoluminescence level of a meteorite provides an indication of its terrestrial age and whether it has experienced recent reheating such as that associated with a small perihelion orbit ($\lesssim$0.7 a.u., say) or shock heating to $\gtrsim$250°C within the last 10^6 years or so. Further details can be found in a recent paper on the comparison of natural TL levels and ^{26}Al activities for 23 Antarctic meteorites (Hasan et al., 1987, Proc. 17th Lunar and Planet. Sci. Conf., Part 2, JGR, 92, E703-709). The data below are the first results from a laboratory set up by Fouad Hasan and Derek Sears, of the University of Arkansas, to systematically measure natural TL levels in returned Antarctic meteorites (see AMN 10(1), page 3). It is hoped that such data will help in the selection of samples with interesting radiation and thermal histories.

Table 4. Natural thermoluminescence level in meteorites recovered during the 1985/86 field season. (Data set: October 1987)

NAME	LT/HT@	E.D.†	NAME	LT/HT@	E.D.†
ALH 85016,2	2.5±0.2	101±12	ALH 85039,2	1.75±0.02	44±3
ALH 85017,2	0.498±0.007	4.2±0.7	ALH 85040,2	2.40±0.01	37±5
ALH 85018,2	2.10±0.04	36±3	ALH 85041,2	1.29±0.04	14±5
ALH 85020,4	2.33±0.09	14±2	ALH 85042,2	2.71±0.07	39±9.5
ALH 85023,2	3.03±0.07	51±1	ALH 85043,2	5.0±0.5	43±7
ALH 85026,2	2.2±0.1	28±10	ALH 85044,2	1.42±0.02	15±2
ALH 85027,2	3.5±0.2	85±147	ALH 85045,2	3.35±0.08	38±6
ALH 85028,2	1.28±0.08	13±2	ALH 85048,2	1.14±0.03	8±1
ALH 85029,2	1.83±0.06	69±3	ALH 85052,2	0.23±0.01	2.1±0.5
ALH 85030,2	1.85±0.08	29±4	ALH 85054,2	0.69±0.05	5±1
ALH 85031,2	0.18±0.01	1.1±0.5	ALH 85056,2	0.44±0.01	2.9±0.4
ALH 85033,2	9.7±0.1	83±24	ALH 85059,2	2.8±0.2	52±5
ALH 85034,2	2.4±0.2	86±8	ALH 85062,2	3.2±0.3	36±2
ALH 85035,2	0.57±0.01	12±2	ALH 85063,2	0.77±0.02	17±2.5
ALH 85037,2	0.47±0.01	7.2±0.5	ALH 85065,2	2.17±0.02	34±4
ALH 85038.2	1.78±0.02	11±3.5	ALH 85066,2	3.9±0.1	38±3.4

Table 4, Continued.

NAME	LT/HT@	E.D.†
ALH 85070,2	4.9±0.1	72±12
ALH 85071,2	0.52±0.01	3.4±0.5
ALH 85073,2	3.79±0.04	75±5
ALH 85075,2	2.64±0.04	45±8
ALH 85076,2	1.24±0.03	37±3
ALH 85077,2	0.73±0.02	8±32
ALH 85079,2	4.47±0.07	63±3.5
ALH 85080,2	3.1±0.3	27±1
ALH 85082,2	1.12±0.03	14±2
ALH 85083,2	2.9±0.3	49±9
ALH 85084,2	2.6±0.1	33±3
ALH 85086,2	3.0±0.2	54±2
ALH 85087,2	2.1±0.1	40±1
ALH 85090,2	4.0±0.2	68±3
ALH 85091,2	1.62±0.13	14±3
ALH 85094,2	4.62±0.09	95±3
ALH 85097,2	4.5±0.1	44±1
ALH 85098,2	0.54±0.02	2.4±0.2
ALH 85100,2	3.1±0.1	40±5
ALH 85102,2	0.111±0.002	1.0±0.1
ALH 85103,2	3.15±0.06	66±7
ALH 85104,2	0.061±0.002	0.59±0.1
ALH 85105,2	3.25±0.05	27±11
ALH 85107,2	1.36±0.04	15±3
ALH 85108,2	0.25±0.04	1.3±0.7
ALH 85110,2	6.38±0.07	122±20
ALH 85112,2	2.73±0.03	51±14
ALH 85114,2	0.767±0.006	12±2
ALH 85115,2	2.84±0.06	47±5
ALH 85118,2	2.29±0.02	15±7.2
ALH 85119,2	0.119±0.006	0.26±0.03
ALH 85120,2	0.840±0.008	5±1.1
ALH 85122,2	0.29±0.01	1.9±0.4
ALH 85123,2	3.8±0.1	57±6.1
ALH 85124,2	0.63±0.03	5±11
ALH 85125,2	0.845±0.006	8±1
ALH 85127,2	0.088±0.003	0.9±0.1
ALH 85128,2	0.44±0.01	3±120
ALH 85129,2	2.2±0.1	55±914
ALH 85131,2	2.02±0.03	33±52
ALH 85132,2	1.91±0.08	29±75
ALH 85133,2	3.1±0.2	53±67
ALH 85135,2	2.54±0.03	28±20.03
ALH 85136,2	1.41±0.07	43±10
ALH 85137,2	0.066±0.001	1.2±0.24
ALH 85141,2	1.49±0.03	14±26
ALH 85142,2	1.73±0.01	36±41
ALH 85143,2	0.547±0.007	4±11
ALH 85144,2	4.6±0.1	96±9
ALH 85146,2	3.2±0.1	36±6
BOW 85800,2	2.5±0.2	39±3
DOM 85501,2	0.49±0.02	4.0±0.5
DOM 85502,4	2.1±0.1	25±2
DOM 85503,2	2.21±0.05	44±7
DOM 85504,2	2.90±0.08	34±3
DOM 85505,2	1.11±0.02	8.1±0.7
DOM 85506,2	3.09±0.08	36±1
DOM 85508,2	1.44±0.05	25±4
DOM 85509,2	2.99±0.04	46±3
DOM 85510,2	3.37±0.08	45±9
GEO 85700,2	0.83±0.02	18.7±0.8
GEO 85701,2	3.7±0.1	63±7
GRO 85203,2	5.1±0.2	55±5
GRO 85204,4	2.5±0.1	53±5
GRO 85205,2	1.71±0.02	31±4
GRO 85207,3	3.91±0.02	44±4
GRO 85208,4	3.7±0.01	42±3
GRO 85209,2	1.3±0.4	26±4
GRO 85210,2	1.58±0.02	18±2
GRO 85211,2	2.35±0.08	40±8
GRO 85212,2	3.77±0.04	74±11
GRO 85213,2	4.92±0.07	61±8
GRO 85214,5	3.8±0.1	72±17
GRO 85215,2	0.066±0.001	0.80±0.04
GRO 85216,2	0.99±0.01	9±3
GRO 85218,2	0.54±0.02	3±1
GRO 85463,2	0.10±0.01	1.5±0.2
LEW 85301,2	1.08±0.04	0.41±0.03
LEW 85303,3	2.6±0.4	31±2
LEW 85305,2	0.20±0.01	0.10±0.01
LEW 85313,3	2.22±0.05	4.4±0.4
LEW 85314,2	2.19±0.03	22.2±0.7
LEW 85315,2	1.54±0.04	24±4
LEW 85316,2	2.9±0.1	38.5±0.1
LEW 85317,2	2.19±0.01	34±5
LEW 85318,4	0.97±0.01	16±1
LEW 85319,4	0.66±0.01	4.9±0.5
LEW 85321,1	2.46±0.05	34±3
LEW 85322,4	2.44±0.08	48±9
LEW 85323,2	0.61±0.01	8±2
LEW 85325,4	1.41±0.06	40±2
LEW 85324,5	2.0±0.2	28±4
LEW 85327,11	0.07±0.01	0.8±0.1
LEW 85329,2	1.71±0.08	28±3

Table **4**, Continued.

NAME	LT/HT@	E.D.†	NAME	LT/HT@	E.D.†
LEW 85330,2	0.98±0.02	19±3	LEW 85386,2	0.024±0.001	0.25±0.02
LEW 85331,2	2.7±0.1	55±3	LEW 85398,2	1.1±0.1	5±1
LEW 85333,2	2.9±0.1	30±5	LEW 85402,2	1.96±0.06	27±1
LEW 85334,2	1.73±0.03	9±2	LEW 85403,2	1.31±0.03	13±1
LEW 85335,2	0.63±0.01	9±2	LEW 85404,2	2.13±0.06	23±5
LEW 85336,2	4.1±0.2	54±3	LEW 85405,2	0.56±0.02	3±1
LEW 85337,2	0.85±0.03	8±1	LEW 85406,2	1.53±0.03	11±1
LEW 85338,2	1.70±0.04	14±1	LEW 85413,2	0.70±0.02	8±1
LEW 85340,2	1.77±0.05	45±10	LEW 85418,2	0.84±0.02	18±1
LEW 85341,2	1.09±0.07	7±1	LEW 85420,2	4.6±0.2	58±4
LEW 85343,2	2.24±0.08	31±6	LEW 85423,2	2.0±0.1	33±1
LEW 85345,2	2.5±0.2	31±4	LEW 85426,2	0.61±0.01	4.0±0.5
LEW 85346,2	2.8±0.3	35±4	LEW 85427,2	3.9±0.2	32±7
LEW 85347,2	2.9±0.3	20±4	LEW 85428,2	1.06±0.03	30±7
LEW 85348,2	1.39±0.04	16±2	LEW 85429,2	2.99±0.06	47±7
LEW 85350,2	0.84±0.02	7±2	LEW 85433,2	4.50±0.04	27±6
LEW 85351,2	0.60±0.02	3.0±0.2	LEW 85441,2	1.15±0.01	0.32±0.05
LEW 85352,2	0.61±0.03	2.5±0.5	LEW 85443,2	2.63±0.06	26±2
LEW 85353,2	0.17±0.01	0.5±0.2	LEW 85445,2	1.69±0.03	29±2
LEW 85354,2	0.07±0.01	1.9±0.4	LEW 85446,2	2.75±0.07	50±7
LEW 85356,2	1.1±0.1	20±6	LEW 85448,2	8.2±0.2	83±6
LEW 85357,2	0.60±0.02	9±3	LEW 85449,2	0.59±0.04	3±1
LEW 85359,2	1.6±0.1	31±6	LEW 85450,2	0.46±0.05	3±1
LEW 85360,2	0.037±0.001	0.55±0.03	LEW 85451,2	0.134±0.004	1.6±0.2
LEW 85362,2	0.71±0.03	7±2	LEW 85454,2	0.226±0.001	1.70±0.06
LEW 85368,2	0.063±0.003	1.13±0.04	LEW 85455,2	0.26±0.01	2.0±0.2
LEW 85371,2	1.7±0.2	30±3	LEW 85456,2	3.33±0.03	24±3
LEW 85373,2	1.4±0.2	58±15	LEW 85457,2	0.213±0.004	2.5±0.2
LEW 85379,2	1.10±0.02	15±3	LEW 85458,2	2.06±0.04	33±1
LEW 85380,2	0.63±0.01	9±1	LEW 85459,2	0.26±0.01	1.7±0.1
LEW 85381,2	0.69±0.03	14±5	LEW 85460,2	0.914±0.004	8±1
LEW 85383,2	2.1±0.1	26±2	LEW 85461,2	3.9±0.1	59±14
LEW 85384,2	2.71±0.03	33±2	LEW 85464,2	0.99±0.02	7±1
LEW 85385,2	0.72±0.01	6.1±0.4	LEW 85465,2	0.52±0.02	19±3
			LEW 85472,2	1.63±0.05	32±6

@ Ratio of the height of the low temperature peak (~250°C) to the height of the high temperature peak (~400°C).

† E.D.: Equivalent dose in krad at 250°C glow-curve temperature. (Note that due to a calibration error, values quoted in Hasan et al., 1987, are too high by a factor of 14.04.)

AMLAMP ANNOUNCES THEMATIC MAPS

The Antarctic Meteorite Location and Mapping Project (AMLAMP) has been producing meteorite location maps of the Allan Hills - David Glacier region and is now announcing the availability of thematic maps and the 1987 edition of the meteorite location map set. These maps represent an effort to provide clearer views of meteorite distributions for use in meteoritic and glaciological investigations.

The 1987 edition of the meteorite location map set has been expanded to include the Allan Hills Main Icefield along with updates and corrections to the 1986 edition. The map set displays local geographic features such as ice/firn boundaries, moraine boundaries, and escarpments as well as meteorite and survey station locations. The icefields currently included in the map set, scales, and number of sheets per map are shown below.

Icefield	Scale	Sheets
Allan Hills Main	1:10000	2
Allan Hills Near Western	1:12500	1
Allan Hills Middle Western	1:25000	1
Allan Hills Far Western	1:25000	2
Elephant Moraine	1:12500	1

Thematic maps are produced according to a requestors design specifications as described in a Thematic Map Design Form (a sample is shown below). To design a thematic map the requestor is first asked to specify the icefields to which the design is to be applied by marking the appropriate field. Next a map title may be supplied which will be included in the legend box of the specified maps. A requestor is allowed to select up to six thematic definitions and to associate a unique colored symbol with each theme. These symbols will be placed on the specified icefield maps to designate the meteorites which represent each of the selected themes. At present, thematic map parameters are limited to meteorite classifications but as information is acquired weight and terrestrial age options will be made available for map design. Classification theme definitons may be specified explicitly (i.e. "H-5 CHONDRITE") for a narrow scope or by using the wildcard specifier (i.e. "* CHONDRITE") for a broader scope. The wildcard specifier, "*", may appear anywhere and any number of times in a thematic definition. The form and terminology of the Antarctic Meteorite Newsletter should be observed when specifying classification theme definitions. Symbol color and type are specified by selecting the desired number from the available colors and types listed at the bottom of the form.

The goal of AMLAMP is to compile and maintain a database of Antarctic meteorites and to produce maps of their locations. The database information is obtained from the Antarctic Meteorite Newsletter and the Meteorite Working Group and is current through the 1986-87 collection season. Existing maps will be updated as additional information is acquired and new maps will be added as information from other icefields is received. Announcements will be made as new or updated maps become available.

If you would like to order the new edition of the meteorite location map set or request thematic maps, please complete the Thematic Map Design and/or the AMLAMP Map Request Forms. All maps will be sent rolled in mailing tubes.

Sample AMLAMP Map Request Form

AMLAMP
Lunar and Planetary Institute
3303 NASA Road 1
Houston, TX 77058-4399
(713)486-2184

Requested By		Ship To	
	Name and Address		Name and Address or SAME

Daytime Telephone: (123) 456-7890 (Very Important!)

Number of Location Map Sets	1	x $10.00/set	=	$	10.00
Number of Thematic Map Sheets	3	x $10.00/sheet	=	$	30.00
(US/Canada or Foreign surface) Shipping and Handling			=	$	8.00
		Total	=	$	48.00

Please make checks payable to the Lunar and Planetary Institute.

Foreign air freight rates vary with destination. Call for exact rates.

Sample Thematic Map Design Form

Icefield Sheets

(x) Allan Hills Main - North
(x) Allan Hills Main - South
( ) Allan Hills Near Western
( ) Allan Hills Middle Western
( ) Allan Hills Far Western - East
( ) Allan Hills Far Western - West
(X) Elephant Moraine

Map Title: H and L Chondrites (22 char. max.)

	Theme Definition	Color No.	Symbol No.
1.	H-3 CHONDRITE	1	6
2.	H-4 CHONDRITE	2	2
3.	H-5 CHONDRITE	3	5
4.	H-6 CHONDRITE	4	1
5.	L-* CHONDRITE	6	4
6.			

Colors: 1)Red, 2)Green, 3)Blue, 4)Orange, 5)Cyan, 6)Magenta

Symbols: 1)Asterisk, 2)Box, 3)Circle, 4)Diamond, 5)Star, 6)Triangle

AMLAMP Map Request Form

AMLAMP
Lunar and Planetary Institute
3303 NASA Road 1
Houston, TX 77058-4399
(713)486-2184

Requested By		Ship To

Daytime Telephone: (   )   -

Number of Location Map Sets ____	x	$10.00/set	=	$ ________
Number of Thematic Map Sheets ____	x	$10.00/sheet	=	$ ________
(US/Canada or Foreign surface) Shipping and Handling			=	$ 8.00
		Total	=	$ ________

Please make checks payable to the Lunar and Planetary Institute.

Foreign air freight rates vary with destination. Call for exact rates.

Thematic Map Design Form

Icefield Sheets

( ) Allan Hills Main - North
( ) Allan Hills Main - South
( ) Allan Hills Near Western
( ) Allan Hills Middle Western
( ) Allan Hills Far Western - East
( ) Allan Hills Far Western - West
( ) Elephant Moraine

Map Title: (22 char. max.)

Theme Definition	Color No.	Symbol No.
1.		
2.		
3.		
4.		
5.		
6.		

Colors: 1)Red, 2)Green, 3)Blue, 4)Orange, 5)Cyan, 6)Magenta

Symbols: 1)Asterisk, 2)Box, 3)Circle, 4)Diamond, 5)Star, 6)Triangle