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Abstract – This issue of the Meteoritical Bulletin reports on 1075 meteorites divided between 468 non-Antarctic and 607 Antarctic meteorites. Written descriptions are given for eight falls (Fuhe, Kemer, Lorton, Mason Gully, Mifflin, Red Canyon Lake, Varre-Sai, and Whetstone Mountains). Particularly notable are descriptions and chemical data for 42 new iron meteorites, many of which are unpaired. Also reported are seven Martian meteorites totaling 1447.1 g (four non-Antarctic) and 14 lunar meteorites totaling 9451 g (10 non-Antarctic). Other noteworthy meteorites include NWA 5958, a C3.0-ung with an extremely ^{16}O-rich bulk oxygen isotopic composition; Sayh al Uhaymir 493, an ungrouped achondrite with significant ferric iron, and Northwest Africa 6704, an unusual ungrouped achondrite characterized by relatively ferroan mafic silicate minerals with oxygen isotopic composition that plots within the field for acapulcoites-lodranites. Also reported are two new dense collection areas: Biduna Blowhole in Australia and Stump Spring in the United States. Antarctic meteorites reported include those recovered by the ANSMET (US) and NIPR (Japan) meteorite recovery programs.

*Prepared by the Nomenclature Committee of the Meteoritical Society under the Editorship of L. Garvie. Members for 2011 are M Grady, R Greenwood, J Grossman (Database editor), H Haack, C Herd (Chair), W Hsu, T Mikouchi, S Mostefaoui, S Murty, P Rochette, A Ruzicka, C Smith (Secretary), M Weisberg, K Welten, L Welzenbach. Further information can be found at http://meteoriticalsociety.org/bulletin/TermExpirations2012.htm

INTRODUCTION

The Meteoritical Bulletin is the announcement for meteorite names and classifications that have been reviewed and approved by the Meteoritical Society's Meteorite Nomenclature Committee. Guidelines for meteorite nomenclature as well as information on submitting a meteorite for review can be found on the society's webpage (http://meteoriticalsociety.org/). Additional information on meteorites reported in tables can be found in the Meteorite Bulletin Database, which can be accessed from the society website.

FALLS

Fuhe **31°28'32"N, 113°34'01"E**

Suizhou City, Hubei Province, China
Fell: June 1945
Classification: Ordinary chondrite (L5)

History: In June 1945, a stone fell into the backyard of Mr. Chen, who lived in Dongjiagang village, Fuhe town, Suizhou city, Hubei province, China. The stone was left in the yard for many years and later mounted on a wall. The grandson of the finder noticed the unusual character of the stone and brought it to China University of Geosciences at Wuhan for identification in April 2010.

Physical characteristics: Total mass of the stone is 23 kg. Most fusion crust has been weathered, but a few black patches remain. The outer 2 to 3 cm of the stone is weathered, as seen in cross section.

Petrography: Well-defined chondrules range in size from 400 to 1200 µm with barred olivine chondrules being most abundant. Shock veins are visible in hand specimen. There are several clasts of chromite fragments set in plagioclase groundmass.

Geochemistry: Xiao Long (*CUG*) EMP: Olivine $Fa_{24.20\pm0.26}$; pyroxene $Fs_{22.12\pm0.98}Wo_{1.49\pm0.23}$.

Classification: Ordinary chondrite (L5)

Specimens: A mass of 2.3 kg is on deposit at *CUG*. Mr. Jun Chen holds the main mass.

Kemer **36°32'31"N, 29°25'05.6"E**

Mugla, Turkey
Fell: March 3, 2008
Classification: Ordinary chondrite (L4)

History: Sonic booms were heard between 11 am and noon local time south of Kemer Town, Fethiye County, Mugla. A young woman, Mrs Rabia Saadet, was hanging out her washing when she was startled by a loud booming sound. A stone fell about 50 m away in her wheat field by her house. Panicked, she hid in her home. Later she went back to the field and discovered a black stone buried about 25 cm. Her father called the village chief, "muhtar", who called the local police. Another rock was found 500 m away and both were taken to Fethiye Governor's Office. Mesut Kasikci, a meteorite hunter living in France called the muhtar and informed Prof. Mehmet Emin Özel, an astrophysicist at *CanaU*, Physics Department, of the fall. Prof. Özel and Tamer Akin, his assistant, went to Fethiye and acquired the stones from the Governor. A third piece was found ten days later.

Physical characteristics: Three fusion crusted stones were found: Stone 1, 4×11×7.5 cm, 2.56 kg; Stone 2, 1.7 kg, 36°32'39.9"N, 29°24'49.9"E; and Stone 3, 1.5 kg - 36°32'35.4"N 29°24'20"E).

Petrography: Matrix poor, chondrule rich. Chondrules of variable sizes and textures, some slightly deformed. Occurrence of rare relict olivines, chromites, two phosphates: chlorapatite and whitlockite up to 300 µm. An idiomorphic Zr oxide was observed in an ilmenite crystal from a chondrule. Amoeboid objects containing diopside, chromite and feldspar. Polycrystalline sulfides, healed faults and maskelynite.

Geochemistry: EMPA of crystals indicate a more homogeneous composition for the olivine (Fa_{23-25} average 24, sd=1) than for the pyroxene (average Fs_{19}, sd=4).

Classification: Ordinary chondrite (L4)

Specimens: A sample of 157.2 g from the first stone, a PTS and a thick PS are on deposit at the *MNHNP*. Mr Kasikçi holds the main mass. The second (1.7 kg) and the third (1.5 kg) stones are kept by Prof. Özel now at *CagU*.

Lorton **38.70066°N, 77.21163°W**

Virginia, United States
Fell: 18 Jan 2010, 5:45 PM EST (UT-5)
Classification: Ordinary chondrite (L6)

History: People in the greater Washington DC area (with reports from as far away as West Virginia) describe seeing a large, single, fireball near dusk on Monday, January 18th, 2010 (~5:45 pm). Some describe hearing a large detonation. One stone fell through the roof and ceiling of the Williamsburg Square Family Practice in Lorton, Virginia. The meteorite was found embedded in the concrete floor (under the carpet), apparently having broken into three large pieces and a number of smaller pieces upon impact. The doctors were present at the time the meteorite fell, and describe hearing a sound akin to bookshelves crashing to the ground. The meteorite was taken to the Smithsonian Institution for identification.

Physical characteristics: The meteorite is approximately 8 x 5 x 5 cm, roughly rectangular, with dark, matte fusion crust. The interior is fresh, with no evidence of oxidation of the metal grains, which are small and evenly distributed throughout the rock. A few small poorly defined chondrules are visible with the naked eye. The total mass recovered is 329.7 g.

Petrography: Shock stage: S1 (olivines have irregular fractures). Weathering grade: W0. Shock veins absent. Chondrules are rare. When present, chondrule outlines are diffuse and show some degree of recrystallization, with many crystals exhibiting 120° triple junctions. Metal and sulfide occur mostly as separate, blocky grains.

Geochemistry: (C. Corrigan, *SI*) Olivine, $Fa_{24.7\pm0.3}$ (n=23), pyroxene $Fs_{20.9\pm0.3}Wo_{1.6\pm0.2}$ (n=16), feldspar $An_{10.3\pm0.3}Or_{6.4\pm2.8}$ (n=14)

Classification: L6 chondrite

Specimens: Entire mass is at *SI*.

Mason Gully [coordinates temporarily withheld]

Western Australia, Australia
Fell: 13 April 2010 at 10h36m10s UTC
Classification: Ordinary chondrite (H5)

History: A bright fireball was recorded over southwestern Australia by observatories of the Desert Fireball Network. A fall position was pinpointed by triangulation (Pavel Spurny, *CzAS*), and a search was mounted (Martin Towner, *ICL*). A stone was recovered 3rd November 2010, within 150 m of the predicted fall site.

Physical characteristics: (Gretchen Benedix, *NHM*; Philip Bland, Kathryn Dyl, Martin Towner, *ICL*). An ~3 cm, 50% fusion crusted, 24.54 g stone was recovered. Individual pyroxene, olivine, and feldspar crystals are visible on the broken surface, with no evidence of alteration of silicates. Some rust patches visible around metal grains on original broken surfaces. Although the meteorite appears to have high porosity (based on observations of sawn surfaces), metal in the interior shows no sign of alteration. Fusion crust is black and fresh.

Petrography: (Gretchen Benedix, *NHM*). The meteorite has a typical petrologic type 5 texture, with discernible, but not distinct chondrules. Chondrule types include BO and RP. Minerals are heterogeneously distributed. Modal mineralogy (in vol%) is: olivine 33; orthopyroxene 38; clinopyroxene 5; plagioclase 8; metal 11; sulfide 5; minor components around 1.

Geochemistry: (Gretchen Benedix, *NHM*; Richard Greenwood, Ian

Franchi, Jenny Gibson, *OU*). Mineral compositions as determined by EMP: olivine, $Fa_{19.2\pm0.6}$; low-Ca pyroxene, $Fs_{16.\pm0.4}Wo_{1.4\pm0.3}$; chromite (Fe/Fe+Mg=0.84; Cr/Cr+Al=0.86). Oxygen isotopes: $\delta^{17}O$=3.04‰, $\delta^{18}O$=4.42‰, and $\Delta^{17}O$=0.74‰.
Classification: Ordinary chondrite (H5), S1, minimal weathering.
Specimens: The stone and one thin section are on deposit at *WAM*.

Mifflin **42°54'27"N, 90°21'56"W**
Iowa County, Wisconsin, United States
Fell: April 14, 2010, 10:07 pm CDT (UT-5)
Classification: Ordinary chondrite (L5)
History: A bright fireball was seen by numerous observers in parts of Wisconsin, Iowa, and Illinois the night of April 14th, 2010. A camera on the roof of the Atmospheric and Oceanic Sciences Building at the University of Wisconsin-Madison captured two images of the fireball at around 10:07 PM. The track was recorded by Doppler radar. Residents in Mifflin Township, Wisconsin, heard large explosions at the same time. The first stone recovered (7.4 g) hit the metal roof of a shed and was found the following day; it was identified as a meteorite at the University of Wisconsin-Madison. Numerous stones fell as a shower mainly in the area of Mifflin Township within a total distance of 20 km. More than 70 stones and fragments were recovered in the area within a few weeks after the fall.
Physical characteristics: Total mass recovered is more than 3.5 kg. The largest stone (332 g) is owned by the finder and private collectors. Most pieces are fully enclosed in fusion crust.
Petrography, description, and classification (N. Kita, J. W. Valley, D. Nakashima, T. Ushikubo, M. J. Spicuzza, *UWisc*; G. MacPherson, L. Welzenbach, *SI*; A. M. Davis, *UChi*; P. R. Heck, *FMNH*). Most stones are partly to fully fusion crusted. Some broken surfaces show brecciated texture, with dark and light clasts. Black-colored shock veins up to a few mm long were observed. Chondrules are not obvious in hand specimen, but are visible in thin section.
Geochemistry: Mineral compositions and geochemistry: Olivine $Fo_{75.1\pm0.2}$, n=15; low-Ca pyroxene $En_{78.9\pm0.2}Wo_{1.5}$, n=16. Oxygen isotope analysis (Mike Spicuzza by laser fluorination/gas-source MS): $\delta^{18}O$=4.84‰, $\delta^{17}O$=3.65‰, and $\Delta^{17}O$=1.13‰.
Classification: Ordinary chondrite (L5), shock stage S1.
Specimens: Type specimen 21.09 g, *SI*. Other stones at: *UWisc*: 142 g; *FMNH*: 48 g, 17.8 g, 13.1 g, 6.94 g.

Red Canyon Lake **38°8.245'N, 119°45.487'W**
Tuolumne Co., California, USA
Fell: 11 Aug 2007
Classification: Ordinary chondrite (H5)
History: Just after midnight on August 11, 2007, a bright fireball traveling in a S57°E direction was witnessed throughout northern and central California. Representatives with the Sonora Police Department and both the Tuolumne and Calaveras County Sheriff's Departments fielded numerous calls early on the morning of the 11th in regards to a loud boom, and structures shaking. Campers around Markleeville, Soulsbyville, and Beardsley Lake reported sonic booms and ground shaking. A video from the fireball from Yuba City placed the breakup at 5 ' +7 " past midnight. A single stone was picked up by a hiker, Ben Deutsch, near Red Canyon Lake, Tuolumne County, California, shortly after the fireball event.
Physical characteristics: One black fusion-crusted stone was recovered. The interior of the stone is exceptionally fresh with no signs of oxidation of the metal. Matrix is light gray with an abundance of metal and sulfide and a smattering of well-defined, gray, <1 mm chondrules. Only one stone of 18.41 g was recovered.
Petrography: (Laurence Garvie, *ASU*) The stone has an overall recrystallized texture, with a few well-defined chondrules. Feldspar is not well developed. One metal-rich vein traverses the stone. Areal percentages determined from one thin section show 5.5% metal, 2.0% troilite, and 0.01% chromite. Contains a rare unidentified Fe-Cr sulfide.
Geochemistry: (Laurence Garvie, *ASU*) Olivine - $Fa_{19.40}$ (range 19.23 to 19.58, n=9); Pyroxene - $Fs_{16.74}$ (range 16.54 to 16.89) and $Wo_{1.11}$ (range 0.76 to 1.30).
Classification: Ordinary chondrite (H5), shock stage S1
Specimens: *ASU* holds 4.24 g distributed between a complete slice, two thin sections and an end piece in a potted butt.

Varre-Sai **20°51.041'S, 41°44.808'W**
Rio de Janeiro, Brazil
Fell: 19 June 2010, 21:00 UT
Classification: Ordinary chondrite (L5)
History: At about 21:00 UT (around noon local time) on June 19, 2010, a bright fireball was observed over the eastern side of Brazil. Mr. Germano, who lives at the border of Rio de Janeiro and Espirito Santo, heard several explosions and saw two black objects falling. One ~600 g stone fell about 15 m from him. Early the next day, he found another piece beneath a banana tree. The site of the fall belongs to the city of Varre-sai. The precise location is about 17 km from Varre-Sai (Rio de Janeiro state) and 8 km from Guaçui (Espírito Santo state). The first piece recovered was about 100 m inside the border of the state of Rio de Janiero.
Physical characteristics: Five masses with a total weight of about 2.5 kg were recovered. Most stones are partly to fully fusion crusted. Broken and cut surfaces are light gray, with a few black shock veins.
Petrography: (M.E. Zucolotto, L.L. Antonello, M.E. Varela) Chondrules and chondrule fragments are observed in a recrystallized matrix cut by dark thin veins. Mineralogy dominated by olivine, pyroxene, plagioclase, sulfides and Fe-Ni metal. Olivine shows undulatory extinction and mosaicism. Larger grains show fractures and PDFs. Pyroxenes (mostly orthopyroxene) exhibit similar textures as the olivine. Plagioclase typically to 50 μm, some showing undulatory extinction, while a few are twinned. Troilite and Fe-Ni metal occur as irregularly shaped grains. Chondrules range in size from 0.3 to 5 mm, with a mean size of ~0.8 mm. Clearly discernible are a RP (~1.9 mm) and a BO (~2.2 mm) chondrules.
Geochemistry: Mineral compositions and geochemistry: (Magnelli, D, E.and M.E.Varela) Olivine $Fa_{25.0\pm0.2}$; low-Ca pyroxene $Fs_{21.66\pm0.2}Wo_{1.49}$.
Classification: Ordinary chondrite (L5) Shock stage S4, Weathering W0
Specimens: 35 g from the first recovered mass in *MNRJ*, plus two thin sections and a polished stub.

Whetstone Mountains **31°57.711'N, 110°26.051'W**
Arizona, United States
Fall: June 23, 2009 at 9:22 p.m. MST (UTC -7 hours)
Classification: ordinary chondrite (H5 breccia)
History: Many witnesses observed a bright fireball, accompanied by detonations and rumblings, in southern Arizona. Carl Hergenrother estimated magnitude -11 fireball that created shadows, lasted for at least ~2 seconds moving from the southeast part of the sky to the east and downward. Part of the path was recorded by the All-Sky camera at the UA-Multiple-Mirror Telescope facility on Mt. Hopkins and a security camera in Marana, AZ. Jack L. Schrader interviewed eye-witnesses and recovered the first 155.86 g stone on the surface of the high desert less than 45 hours after the fall. Chuck Schrader, Shauna Russell, Robert Ward, Todd Parker, and Mike Farmer found additional stones within a month of the fall.
Physical characteristics: Total known mass as of July 15, 2009 is 2138.74 g among 10 stones. All except one were recovered as intact individuals with complete fusion crust. Some stones exhibit regmaglypts. Fusion crust is fresh, matte black. One stone exhibits a fusion crust with a reddish hue (not oxidation) and others contain a few

"bluish" spots.

Petrography D. H. Hill (*UAz*): Well-defined chondrules (200-700 μm), with porphyritic olivine and pyroxene chondrules being most abundant. Metal grains up to 800 μm and troilite up to 300 μm occur between chondrules in approximately 1:1 proportion. Many metal grains exhibit fingerlike intergrowth of kamacite and taenite. Mg-bearing phosphates ~100 x 200 μm occur between chondrules. A crushed texture is observed that corresponds to a lighter lithology in a darker groundmass. Shock veins are visible in the hand specimen. There are two 350-μm-sized chromite-rich clasts.

Mineral compositions and geochemistry: D. H. Hill (*UAz*) EMP: Olivine $Fa_{18.82\pm0.25}$; pyroxene $Fs_{16.56\pm0.49}Wo_{1.77\pm1.7}$; kamacite Ni 6.71%±0.28 Co 0.49%±0.03, taenite Ni 26% and ~40% Ni (tetrataenite?); phosphates are mostly Mg-rich with a few Cl-bearing.

Classification: Ordinary chondrite (H5) breccia; W0

Type specimens: A total sample mass of 20.36g is on deposit at *UAz* and 131 g at ASU. Jack L. Schrader holds 787.92g; Chuck Schrader holds 99.61g; Shauna Russell holds 465.83g; *Ward* holds 397g; Todd Parker holds 218g.

FINDS

Acfer 234 **27°30'4"N, 4°5'55"E**

Tamanghasset, Algeria
Found: 1991
Classification: Iron meteorite (IAB, ungrouped)

Petrography (F. Brandstaetter, *NHMV*): Kamacite bandwidth 0.082 mm; swathing kamacite around troilite up to > 200 μm. Inclusions are troilite, schreibersite and phosphates. Troilite is most abundant forming "nodules" 1 to 3 mm. No silicates were recognized. Two different (Fe, Mn, Mg, Na) phosphates are present.

Geochemistry: Co (mg/g) 4.48, Ni (mg/g) 87.3, Ga (μg/g) 21.2, Ge (μg/g) ~100, As (μg/g) 12.7, Ir (μg/g) 5.01, Au (μg/g) 1.28

Biduna Blowhole 001 **31°01'S, 131°19'E**

South Australia, Australia
Found: 5 Dec 2009
Classification: Ordinary chondrite (L4)

History: The first piece was found on the Nullarbor Plain by A. Langendam. A further 16 fragments were located within a 30 m radius of the initial find.

Physical characteristics: Combined weight of all 17 pieces is 103.4 g, with the largest piece measuring 5 x 4 x 1 cm. The weathered surface is dark brown to black with small patches of orange lichens. Several pieces fit together like a jigsaw.

Petrography: (Kim Lai N. Bell, *Monash*) Main mass contains up to 65% chondrules, within a dark, heavily rusted matrix. Mineralogy consists of olivine, pyroxene, minor plagioclase, Fe-Ni metal and sulfides. The dominant minerals, olivine and pyroxene, are mostly found in chondrules, with smaller grains (<50 μm) in the matrix. Plagioclase occurs in minor amounts and rarely exceeds 50 μm. Chondrules lack glass, are easy to discern and sometimes rimmed by sulfides or olivine. Chondrule types include RP, POP, GOP, PO and BO, with sizes ranging 0.1-2 mm and averaging 0.4 mm. Olivine and pyroxene grains display irregular to undulose extinctions, with larger grains containing planar fracturing. Up to 97% of the Fe-Ni metals and troilite are replaced by oxides.

Geochemistry: EMPA (wt%) Olivine: SiO_2=38.25, TiO_2=0.02, Al_2O_3=0.02, FeO=24.94, MnO=0.45, MgO=37.47, CaO=0.05, Na_2O=0.01, K_2O=0.01, (Fa=25.6 mol%, σ=2.5, n=6). Low-Ca Pyroxene: SiO_2=56.34, TiO_2=0.10, Al_2O_3=0.21, FeO=14.17, MnO=0.44 MgO=28.38, CaO=0.40, Na_2O=0.03, K_2O=0.01, (Fs=21.44 mol%, σ=2.0, n=6). Kamacite: Ni=5.59, Co=0.58. Troilite: Fe=61.98, Ni=0.10. Fe-Ni sulfide: Fe=56.85, Ni=1.33.

Classification: Ordinary chondrite (L5, S3, W4).

Specimens: All samples and one thin section are held by A. Tomkins at *Monash*.

Bouanane **31°59'N, 3°12'W**

Morocco
Found: 2009
Classification: Ordinary chondrite (L6)

History: P. Thomas (St-André en Vivarais France) acquired this stone and visited the campsite to take GPS coordinates.

Physical characteristics: A single stone showing 20% fusion crust, with signs of repeated hammering on its edges plus a central hole made by percussion. Identified by a specialist of lithic tools (H. de Lumley, *MNHNP*) as a hammer and anvil of probable Neolithic age.

Petrography: The degree of weathering was determined on a 3 cm deep core but seems quite homogeneous, supporting, together with surface state, a rather young terrestrial age unless Neolithic use was followed by sheltering preventing atmospheric alteration.

Campinorte **14°15.48'S, 49°9.55'W**

Goias, Brazil
Found: 1992
Classification: Iron meteorite (ungrouped)

History: Some miners were prospecting ores, when one of them, Mr. Laert, commented that he had found a "steel stone" some years ago. They went to the site and using a metal detector discovered the half-buried mass. Mr. Rosy suspected it to be a meteorite and asked permission of the landowner to remove part of the mass. Mr. Diniz contacted the Museu Nacional, Rio de Janeiro, where it was confirmed to be a meteorite. The farmer removed and kept the rest of the stone.

Physical characteristics: A large pear shaped mass of about 2 tons with no fusion crust or regmaglypts.

Petrography: (M. E. Zucolotto, *MNRJ*) Etched sections shows a Widmanstätten pattern, with an average bandwidth of 1.3±0.2 mm. The kamacite has decorated subboundaries and numerous fine 1 to 5 μm phosphides in the interior. Neumann lines are common in a few kamacite lamellae. Taenite and plessite covers 5-15% by area as comb and net plessite fields; large taenite decomposed to martensitic pattern. Schreibersite occurs as skeletal crystals or on grain boundaries. Rhabdites are common and scattered in kamacite. No large inclusions were present in the sample analyzed, although the presence of the swathing kamacite around some holes suggests the presence of inclusions removed during the cutting process.

Geochemistry: (J.T. Wasson, *UCLA*). Co=5.8, Ni=71 (both mg/g); Cu=92, Ga=74, Ge=610, As=12.2, Ru=26, W=3.05, Re=1.9, Ir=19.6, Pt=33 and Au=1.3 (all in μg/g) obtained by INAA

Classification: Iron meteorite (ungrouped), coarse octahedrite (J.T. Wasson, *UCLA*).

Specimens: A total sample mass of 26.2 g is on deposit in *MNRJ*, and 70.0 g on deposit at *UAb*, including a 49.2 g slice. The main mass is in Campinorte with an anonymous owner.

Dar al Gani 1054 (DaG 1054) **27°25.66'N, 16°09.93'E**

Al Jufrah, Libya
Found: 1999
Classification: Ureilite

History: A single 28.4 g stone was found by Romano Serra in a rocky desert area of Libya.

Physical characteristics: Fusion crust absent. Cut surface displays an achondritic texture.

Petrography: (V. Moggi Cecchi, G. Pratesi, S. Caporali, *MSP*) Sample fine-grained and homogeneous, with mosaicized texture. Dominated by

small (<30 μm) rounded olivine and rare orthopyroxene. Carbon-rich material, including very small diamonds, occurs at grain boundaries but no distinct aggregates of carbonaceous material are visible. Opaque phases dominated by suessite [$(Fe,Ni)_3Si$], dispersed in small (<100 μm) grains or subparallel metal veins, commonly altered to oxides. Presence of rare sulfide grains (mainly troilite).
Geochemistry: Silicates unzoned. Low–Ca pyroxene: $Fs_{12.2-20.9}Wo_{0.7-3.0}$, Cr_2O_3=0.85-0.92 wt%; olivine ($Fa_{11.0–17.1}$, CaO=0.29–0.31 wt%, Cr_2O_3=0.80–0.85 wt%). Suessite (at%) has variable composition, with 2 main clusters at $Si_{21}Fe_{78}$ (Cr=0.68, Ni=0.49) and at $Si_{23}Fe_{74}$ (Cr=1.34, Ni=1.54) -$Fe_{0.96}Ni_{0.04}$. Troilite contains up to 4.3 wt% Cr.
Classification: Achondrite (ureilite, polymict, anomalous). Anomalous features include absence of zoned olivine, mosaicized texture, presence of suessite with variable composition and fine-grained texture. In spite of the similar abundance of suessite, a pairing with NWA 1241 may be excluded considering the different modal pyroxene/olivine ratio.
Specimens: A total of 8 g specimen and one thin section are on deposit at *MSP* (MSP 5138). Romano Serra holds the main mass.

Dar al Gani 1055 (DaG 1055) **27°22.80'N, 16°28.14'E**
Al Jufrah, Libya
Found: 2007
Classification: HED achondrite (Eucrite, polymict)
History: A single 305 g stone was found in 2007 by Romano Serra.
Physical characteristics: The main mass has a small portion of a black fusion crust.
Petrography: (V.Moggi Cecchi, G.Pratesi, S.Caporali, *MSP*) Polymict breccia of fine- and coarse-grained regions. The coarse-grained areas consist of plagioclase and clinopyroxene crystals to 1.6 mm. Fine-grained regions show clino- and orthopyroxene clasts set in fine-grained matrix of unexsolved Fe-rich pigeonite, exsolved pigeonite (orthopyroxene with augite lamellae) and maskelynitized calcic plagioclase. Minor phases include ilmenite and Al-Ti-chromite. Exsolved pyroxene grains show alternating fine low-Ca pyroxene and augite lamellae (2 to 9 μm).
Geochemistry: Maskelynite $An_{78.7-88.5}Or_{0.47-1.46}$; Low-Ca pyroxene $Fs_{32.3-37.7}En_{53.2-59.5}Wo_{2.8-14.5}$ (Fe/Mn=26.8-33); Augite lamellae $Fs_{35.7-44.7}En_{28.4-30.9}Wo_{24.5-35.9}$ (Fe/Mn=30.4-35.7); unexsolved pigeonite, $Fs_{55.3-59.8}En_{32.1-34.6}Wo_{5.6-12.6}$ (Fe/Mn=32.2-35.9).
Classification: Achondrite (eucrite, polymict) with high degree of shock and low degree of weathering.
Specimens: A total of 60 g specimen and one thin section are on deposit at *MSP* (MSP 5104). *OAM* holds the main mass.

Dar al Gani 1057 (DaG 1057) **27°16.8'N, 16°08.87'E**
Al Jufrah, Libya
Found: 1998 Dec 27
Classification: Ordinary chondrite (LL5)
Geochemistry: Breccia. $Fs_{11.0}Wo_{42.5}$; $An_{9.9-10.4}Or_{8.0-3.1}$; chromite TiO_2 3.4-3.6; Al_2O_3 5.9-5.7; MgO 1.6-1.7%.

Dhofar 1612 (Dho 1612) **18°35'N, 54°08'E**
Zufar, Oman
Found: 2010 March 5
Classification: Carbonaceous chondrite (CV3)
Physical characteristics: Whole stone that is mostly covered with black fusion crust.
Petrography: Dominated by large (0.1 to 3.1 mm, mean 1.1 mm) FeO-poor and FeO-rich chondrules with unequilibrated silicates ($Fa_{0.9-57.2}$, mean $Fa_{26.7}$) set in a fine-grained matrix (Fa_{50}). Chondrule types include C, POP, PO, and BO. The meteorite also contains a large type B CAI (3.4×7.3 mm in apparent dimensions).
Classification: Petrology and composition of silicates are consistent with it being a CV3 chondrite.
Specimens: 21.3 g is available at *UAz*.

Dhofar 1619 (Dho 1619) **18°40.475'N, 54°26.397'E**
Zufar, Oman
Found: 4 March 2007
Classification: Carbonaceous chondrite (CM2)
History: A single, black, fusion-crusted stone was found by Michael *Farmer* on March 4, 2007, in the deserts of Oman.
Physical characteristics: One 6.18 g stone (2.5 x 2.5 x 1 cm) in the shape of a concave oriented shield. Fractured, dull-black fusion crust covers most of the stone. Areas without fusion crust and the interior of are dark gray to black, composed of a fine-grained matrix with some white, tan and gray chondrules and inclusions. The stone is highly porous.
Petrography: (Laurence Garvie, *ASU*) Sections show moderately abundant chondrules (to 1 mm), and fine-grained olivine aggregates, mineral fragments (to 0.4 mm, composed mainly of olivine) and sparse CAIs set in a black fine-grained matrix. Metal is rare, occurring mainly as small grains in chondrules. Sulfide and carbonate grains present. Chondrules and mineral fragments are modestly aqueously altered. Chondrules and mineral fragments display well-developed fine-grained rims to 0.3 mm thick.
Geochemistry: (Laurence Garvie, *ASU*) Most of the chondrule olivines are Fo-rich, with CaO=0.26 wt% and Cr_2O_3=0.36 wt%. Olivine shows a wide compositional range from $Fa_{0.50-70.06.}$ Pyroxene is rare and is dominated by orthopyroxene $Fs_{0.7-3.36}Wo_{0.39-3.99.}$ One PP chondrules was found with several small augite grains $Fs_{0.94}Wo_{44.22.}$ Oxygen isotopes: (R. Tanaka and D. Rumble, Okayama University at Misasa), (mean of two replicates: $\delta^{17}O$=-2.87‰; $\delta^{18}O$=3.26‰; $\Delta^{17}O$=-4.59‰).
Classification: Carbonaceous chondrite (CM2).
Specimens: *ASU* holds 3.321 g, five thin sections and one polished stub.

Gove **12°15.8'S, 136°50.3'E**
Arnhem Land, Northern Territory, Australia
Found: 24 February 1979
Classification: Relict meteorite (Relict iron)
History: A deeply oxidized mass of "fossil" iron meteorite was excavated from bauxite at an open cut mine on the Gove Peninsula.
Physical characteristics: The original mass is reported to have measured 0.75 to 1 m in diameter and is of unknown weight. On removal from the bauxite, the meteorite was described as being encased in a sheath of iron oxides,.
Petrography: The meteorite is almost completely altered to oxides and oxyhydroxides of iron and nickel. Polished sections of competent fragments retain a relict Widmanstätten pattern (approximate bandwidth 0.5 mm) preserved in iron oxides. In the microstructure there are vestiges of former structures (plessite fields) now preserved in iron oxides, and small relict grains of primary minerals such as taenite (27 wt% Ni) and daubreélite. Secondary minerals as the result of weathering include awaruite.
Geochemistry: An analysis at the mine site laboratory by company chemist D. H. Harper gave 8.5 wt% Ni. Modern analysis (J.T. Wasson *UCLA*; INAA, single analysis) of oxidized material gave Ni=32.9, Co=3.67 (both mg/g), Cr=168, Cu=195, Ga=22.5, Ge=<70, As=4.16, W=1.35, Ir=10.5, Pt=21.2, Au=0.672 (all μg/g), Sb=<150, Re=844 (both ng/g).
Classification: Iron (chemical group unknown, fine octahedrite; possibly group IVA or IIIAB).
Specimens: Main mass (immersed in kerosene) at Geoscience Australia, Canberra. Fragment measuring 23x15x10 cm at the Alcan Gove Pty mine site, Northern Territory. 1164.8 g of fragments at *WAM*. 590 g of fragments at the Northern Territory Museum, Darwin. Analyzed sample at *UCLA*.

Hautes Fagnes **50°35'N, 6°10'E**

Liège, Belgium

Found: 1965

Classification: Ordinary chondrite (LL5)

History: Found in the Hautes Fagnes region on a raised bog of sphagnum moss, during a school excursion. It was kept by a teacher for more than 40 years before being recognized as a meteorite.

Classification: Classified by Walter De Vos (*RBINS*) using XRD, SEM-EDXA, electron microprobe, and SEM-EDS.

Ifould Lake 001 **30°51'S, 132°05'E**

South Australia, Australia

Found: 24 Aug 2008

Classification: Ordinary chondrite (L5)

History: A solitary piece was found lying on the stony surface of the Nullarbor Plain by K.L. Bell.

Physical characteristics: The sub-rounded, pyramidal-shaped stone weighs 40.9 g and measures 3.5 cm on the longest axis. The exterior is dark reddish brown, with the exception of darker, remnant fusion crust (~10%) and several paler colored macro-chondrules, up to 5 mm. The interior is dark brown to black and shows chondrules and metallic specks.

Petrography: (Kim Lai N. Bell, *Monash*). Chondrules and chondrule fragments lie within a fine-grained recrystallized matrix cross cut by dark µm to mm thick veins. Mineralogy consists of olivine, pyroxene, plagioclase, sulfides, Fe-Ni metal and minor ringwoodite, maskylenite and chromite. Olivine displays undulose to mosaic extinction, and larger grains contain PDFs. Pyroxene grains also exhibit similar textures. Plagioclase generally >50 µm, with some grains replaced by maskylenite. Troilite (~10%) and Fe-Ni metal (3%) occur as irregularly shaped grains, with up to 35% replaced by oxides. Chondrules 0.3 to 5 mm, mean ~0.6 mm, with some more readily discernable than others due to recrystallization. Textural types include BO, POP, GOP, PP, RP, PO, and PP. An Al-rich chondrule containing maskylenite, olivine and very fine-grained chromite was observed.

Geochemistry: EMPA (wt%) Olivine: SiO_2=37.55, TiO_2=0.01, Al_2O_3=0.03, FeO=23.32, MnO=0.47, MgO=38.52, CaO=0.02, Na_2O=0.01, K_2O=0.01, (Fa=25.35 mol%, σ=0.79, n=11). Low-Ca pyroxene: SiO_2=54.24, TiO_2=0.18, Al_2O_3=0.27, FeO=14.37, MnO=0.45, MgO=28.59, CaO=0.64, Na_2O=0.03, K_2O=0.01, (Fs=21.72 mol%, σ=0.73, n=2). Plagioclase: SiO_2=71.14, TiO_2=0.05, Al_2O_3=22.94, FeO=0.24, MnO=0.01, MgO=0.01, CaO=2.30, Na_2O=2.60, K_2O=1.08 (An=28.95, σ=1.84, n=5). Kamacite: Ni=6.39, Co=0.89. Troilite: Fe=62.96, Ni=0.10. Pentlandite: Ni=8.49, Co=0.34.

Classification: Ordinary chondrite (L5, S5, W2).

Specimens: A single specimen plus one polished thin section are held by A. Tomkins at *Monash*.

Javorje **46°9'44.79"N, 14°11'29.98"E**

Javorje, Poljane Valley, Slovenia

Found: 5 Nov 2009

Classification: Iron meteorite (IIIAB)

History: A 4.92 kg rusty iron mass was found on 5 November 2009 by Mr. Vladimir Štibelj while building a forest road on a steep slope in the woods near the village of Javorje above the Poljane Valley, Slovenia. The sample was buried in weathered Carboniferous quartz sandstones and marlstones at a depth of ~70 cm. Mr. Štibelj informed a geologist Mr. Pavel A. Forjanèiè, who brought the piece to *GeoZS*. SEM/EDS analysis confirmed it was an iron meteorite. An ~11 g slice was sent to *ActLab* for chemical analysis.

Physical characteristics: The meteorite is roughly triangular shaped, with an original mass of 4920 g and dimensions 15×12.5×11 cm. The exterior is partially covered with a thick dark brown and yellow to red-brown crust of secondary iron oxides. A small piece of limonitized host-rock was cemented to the meteorite surface by weathering products. Where crust of weathered material is missing, surface textures of the meteorite clearly indicate octahedral cleavage.

Petrography: (M. Miler, M. Gosar, *GeoZS*) Distinct Widmanstätten pattern with an average bandwidth of 0.99±0.3 mm (n=50). Some kamacite bands exhibit Neumann lines in two different directions. Spaces between kamacite bands are filled by large comb, net, and cellular plessite. Taenite occurs in the form of very thin exsolution lamellae along the boundaries between kamacite bands and as an abundant phase in plessite. Phosphides occur as scarce massive and border schreibersites and numerous rhabdites. Long prismatic and acicular rhabdite crystals, which are perpendicular to each other, form net-like inclusions in kamacite bands. Troilite occurs as relatively large elongated inclusions within kamacite grains and as individual grains at the kamacite/kamacite interfaces. Troilite is associated with rare chromite. Daubréelite forms exsolution lamellae in the troilite. Minute euhedral precipitates of carlsbergite form thin rims around some daubréelite grains. The external surface shows iron hydroxides. Terrestrial weathering has penetrated along some kamacite/kamacite interfaces and rhabdite/kamacite boundaries, forming goethite and akaganéite.

Geochemistry: Composition of major phases (SEM/EDS, *GeoZS*): kamacite (Ni=7.1±0.4; N=24), taenite (Ni=30.1±2.8; N=12), phosphide (Ni=45.7±5.0, P=17.9±0.7; N=16) (all in wt%). Bulk composition (ICP-MS; INAA, *ActLab*): Ni=7.83, Co=0.48 (both in wt%), Ga=25, Ge=47, Ir=7.6, Pt=13.4, As=5.8 (all in ppm), Au=472 ppb

Classification: Iron, medium octahedrite (IIIAB). Moderately shocked, extensively weathered.

Specimens: The type specimen of ~120 g is at *GeoZS*. Main mass held by Mr. V. Štibelj.

Jiddat al Harasis 319 (JaH 319) **19°58.633'N, 56°25.516'E**

Al Wusta, Oman

Found: 30 Jan 2007

Classification: Mesosiderite

Petrography: (R. Bartoschewitz, *Bart*.) Breccia of about 60% pyroxene, 5% feldspar and accessory Ca-phosphate in a partly oxidized metal matrix with minor troilite.

Geochemistry: (R. Bartoschewitz, *Bart*., P. Appel and B. Mader, *Kiel*) $Fs_{30.1-31.6}$; $An_{90.3-93.3}Or_{0.3-0.4}$; kamacite Ni 5.4-5.9, Co 0.6-1.3%.

Classification: (R. Bartoschewitz, *Bart*) Mesosiderite

Specimens: A total of 0.9 g of sample is on deposit at *Kiel*. The main mass and one thin section are on deposit at the Bartoschewitz Meteorite Lab.

Jiddat al Harasis 360 (JaH 360) **19°22.338'N, 55°33.778'E**

Al Wusta, Oman

Found: 9 Mar 2003

Classification: Ordinary chondrite (L, melt rock)

History: One dark brown stone was discovered in the desert about 100 km SW of Haima.

Physical characteristics: One stone of 55.5 g. Magnetic susceptibility log χ ($\times 10^{-9}$ m^3/kg)=4.33.

Petrography: (Bartoschewitz, *Bart*) Fine grained with dominantly anhedral olivine (~0.3 mm, mosaicism and undulatory extinction) in a matrix (<0.05 mm) of olivine, pyroxene and plagioclase, with accessory rounded metal and troilite. Chondrules are lacking. Short, dark, melt veins (approx. 1×0.2 mm) of mainly oxidized metal and sulfides.

Geochemistry: (Bartoschewitz, *Bart* and Appel/Mader *Kiel*) Olivine $Fa_{22.8\ -\ 26.8}$, CaO 0.1 %, Fe/Mn=41 (at%). Low-Ca pyroxenes $Fs_{17.2-26.7}Wo_{2.9-0.8}$; Ca pyroxene $Fs_{18.9-26.2}Wo_{5.5-19.3.}$ metal Ni 13.6-14.3, Co 0.8 (wt%). O-isotopes: (I. A Franchi and R. C. Greenwood, *OU*) $\delta^{17}O$=3.971‰, $\delta^{18}O$=5.792‰, $\Delta^{17}O$=0.959‰.

Classification: (Bartoschewitz, *Bart* and R. C. Greenwood, *OU*) Chondrite (L melt rock)
Specimens: A total of 11.1 g is on deposit at the University of *Kiel*. A sample of 4.3 g and one thin section are on deposit at the Bartoschewitz Meteorite Lab. The main mass is in anonymous hands.

Jiddat al Harasis 395 (JaH 395) **~19°55'N, ~56°15'E**
Al Wusta, Oman
Found: 23 Mar 2000
Classification: HED achondrite (Diogenite)
History unknown.
Physical characteristics: (E. *Haiderer*, *Haiderer* and R. Bartoschewitz, *Bart*) One 243 g brown stone with black specks was discovered by an anonymous finder on March 23, 2000. Magnetic susceptibility log χ ($\times 10^{-9}$ m^3/kg)=4.29.
Petrography: (R. Bartoschewitz, *Bart*) Fine- to medium-grained unbrecciated pyroxenite (0.05 to 1 mm) with primarily protogranular texture composed of orthopyroxene, minor chromite, accessory troilite, and pentlandite.
Geochemistry: (R. Bartoschewitz, *Bart*, P. Appel/B. Mader *Kiel*) Orthopyroxenes $Fs_{19.0\text{-}29.7}$, $Wo_{1.2\text{-}1.8}$, Fe/Mn=29 (at%); olivine $Fa_{29.6}$, Fe/Mn=42 (at%). Pentlandite Ni 2.3, Co 0.1; chromite TiO_2 1.0 to 1.3, Al_2O_3 11.6 to 13.1, MgO 2.7 to 4.3 (wt%). Cr/(Cr+Al) 74 (at%). O-isotopes: (I. A. Franchi and R. C. Greenwood, *OU*): $\delta^{17}O$=1.99‰, $\delta^{18}O$=4.23‰, $\Delta^{17}O$= -0.21‰, $\Delta^{17}O$ linear= -0.23‰.
Classification: (R. Bartoschewitz, *Bart*) Achondrite (diogenite).
Specimens: A total of 20 g is on deposit at *Kiel*, *Bart* holds 10.2 g and one thin section, main mass with anonymous finder.

Lavras do Sul **30°48'S, 53°54'W**
Rio Grande do Sul, Brazil
Found: 1985
Classification: Ordinary chondrite (L5)
History: A single mass weighing ~1 kg was found in a pebbly streambed near the town of Lavras do Sul by Prof. Picada of the Geosciences Institute, UFRGS. He gave it to his colleague Dr. Ary Roisemberg. Geologist Heinrich Frank contacted Dr. Hardy Grunewaldt after seeing the specimen in one of Dr. Roisemberg's lectures
Physical characteristics: The 10x5x6 cm stone is a completely fusion crusted. The interior shows brown spots due to weathering. The sample investigated in *MNRJ* is 67 g.
Petrography: (M.E.Zucolotto, *MNRJ*; L.L. Antonello, CBPF) The meteorite shows a few well-defined chondrules and fragments dispersed in a recrystallized matrix. The best-preserved chondrules are RP and BO. The chondrule sizes vary, mostly between 0.5 to 2.0 mm. Opaque phases are kamacite, taenite, troilite and tetratenite. The latter is observed as a thin layer that borders taenite and plessite. Kamacite is mostly polycrystalline and in some cases the plessite shows pearlitic structure bordered by tetrataenite. Sulfides are abundant and are mainly present as single grains. In places small plagioclase grains (partially isotropic) are observed. Some oxide veins as well as iddingsite penetrate along olivine fractures. Minor oxide is present around some metal grains. Melt pockets are scarce and small. Olivine grains have rims with planar fractures but clean cores, in which weakly mosaic and/or undulatory extinction is observed.
Geochemistry: (M.E.Varela, ICATE; R. Scorzelli, CBPF) Mean compositions are olivine (Fa_{25}) and low-Ca pyroxene ($Fs_{22.6}$).
Classification: Ordinary chondrite (L5); S3-4; weathering W1
Specimens: 57 g plus three thin sections are on deposit in *MNRJ*. Main mass with Dr. A. Roisemberg, UFRGS.

Little Harquahala Mountains **33°41.506'N, 113°38.167'W**
Arizona, La Paz County, USA
Found: Jan 2006
Classification: Ordinary chondrite (H, melt rock)
History: Russell Williams found a single stone in 14 pieces while prospecting for gold in the Little Harquahala Mountains of Arizona, La Paz County, on January 2006.
Petrography: (Laurence Garvie, *ASU*) Low-Ca pyroxene and olivine with lesser albitic plagioclase, Fe-Ni, troilite and minor Ca-phosphate, Cr-rich diopside, and Al-rich glass. Much of the metal has been oxidized. The rock is mostly recrystallized and fine-grained, without recognizable chondrules. The grains display a hypidiomorphic texture. The section is dominated by subhedral and polygonal low-Ca pyroxene (typically 0.1 to 0.3 mm, some to 0.7 mm) and euhedral to anhedral olivine (typically <50 µm, with sparse grains to 0.2 mm). The pyroxene occurs as clusters showing a granoblastic texture, with intervening finer-grained pyroxene, olivine, and intersertal plagioclase. The low-Ca pyroxene grains contain an abundance of chadacrysts and inclusions, primarily olivine, but also Cr-rich diopside, Al-rich glass, and troilite.
Geochemistry: (Laurence Garvie, *ASU*) Olivine $Fa_{19.25}$ (range 18.43 to 19.68), with FeO/MnO=38.49; low-Ca pyroxene $Fs_{16.92}Wo_{4.38}$ (Fs ranges from 16.10 to 18.66 and Wo from 3.19 to 7.12); and plagioclase $An_{16.43}Or_{2.36}$. One 50-µm diopside grain was found $Fs_{9.28}Wo_{39.22}$ with 1.2 wt% Cr_2O_3. Oxygen isotopes replicate analyses (R. Tanaka, *OkaU*) of acid washed, bulk sample by laser fluorination gave $\delta^{17}O$=3.147 and 3.158‰; $\delta^{18}O$=4.571 and 4.750‰; $\Delta^{17}O$=0.739 and 0.656‰.
Classification: H chondrite melt rock, degree of weathering is moderate and shock is low. The meteorite lacks a chondritic texture but has mineral and oxygen isotope compositions with H-chondrite affinities. This stone shows similarities with NWA 2353, 2635, and 3145.
Specimens: *ASU* holds 25.98 g and three thin sections. Main mass R. Williams and J. Blennert.

Llano River **30°31.328'N, 99°44.219'W**
Texas, Kimble County, United States
Found: 1975
Classification: Iron meteorite (IIIAB)
History: A single 4318 g mass (weight after small piece cut off end) was found by Thomas Hobbs in 1975 while he was searching for meteorites with a metal detector around a "meteor crater" just north of Junction, Texas. Mr. and Mrs. Hobbs kept the mass until their curiosity was piqued after watching a television show on meteorites in early 2010. A small end piece was sent to *ASU* and confirmed to be a meteorite.
Physical characteristics: Slightly elongated cuboid stone. Surface moderately weathered with small patches of corroded fusion crust. A few broad regmaglypts cover half the stone, the other side being smoother.
Petrography: (Laurence Garvie, *ASU*) Etched sections show a medium Widmanstätten structure. Kamacite lamellae display numerous subboundaries. Neumann bands are well developed and in several places deformed. A few black taenite wedges are present. Displays well-developed open-meshed, comb and net plessite. Inclusions are rare - the 6×7 cm slice contains three 1-mm rounded troilite and rare schreibersite. A heat-affected zone is up to 2 mm thick on one side of the stone.
Geochemistry: Bulk composition: INAA data (Activation Laboratories - Ancaster, Ontario): Co 5.1 mg/g, Ni 76 mg/g, Ga 17.0 µg/g, Ir 9.7 µg/g, and Au 0.54 µg/g.
Classification: Iron meteorite, IIIAB, medium octahedrite, moderately shocked. Compositionally and structurally similar to San Angelo.
Specimens: Type specimens, 105.3 g slice, 16.3 g slice, end piece 13.8 and 6.8 g, and 9.78 g of fragments are on deposit at *ASU*.

Mount Moroto **2°30'N, 34°45'E**
Karamoja, Uganda
Found after 14 Apr 1995

Classification: Ordinary chondrite (L6)

History: The meteorite was reported as a fall by anonymous local eye-witnesses. The possible fall was reported to have occurred on April 14, 1995, near the Moroto volcano, Moroto district, northeast Uganda. However, the fall history is not well documented and pairing with Mbale is possible.

Physical characteristics: A single fusion-crusted stone was recovered by Mr. Sam Kabale Besigye (Kampala, Uganda). The almost complete stone weighing 752 g from which a small slice had already been cut off was handed over to a German geologist.

Petrography: (A. Greshake, *MNB*). The meteorite is a weakly weathered ordinary chondrite with a few poorly defined chondrules set in a dominantly recrystallized groundmass. Networks of opaque interconnecting shock veins are present.

Geochemistry: Mineral composition as determined by EMP: olivine, $Fa_{23.6}$; pyroxene, $Fs_{20.6.}$

Classification: Ordinary chondrite (L6), shock stage, S4; weathering grade, W0/1.

Specimens: A total of 26 g plus one polished thin section are on deposit at *MNB*. The main mass is held by the anonymous finder.

Northwest Africa 959 (NWA 959)
(Northwest Africa)
Found: unknown
Classification: Iron meteorite (IVA)

Petrography (J. Wasson, *UCLA*): Fine octahedrite with 250-300 µm kamacite bands traversing fields of dark plessite and bounded by taenite that grades through cloudy to about 20-40 µm of clear taenite. Kamacite shows many crossing ε-structure bandlets. Rare, small, unidentified yellowish inclusions showing fewer polishing-induced pits than taenite.

Geochemistry: Co (mg/g) 4.27, Ni (mg/g) 94.8, Ga (µg/g) 1.81, Ge (µg/g) <50, As (µg/g) 14.8, Ir (µg/g) 0.346, Au (µg/g) 2.63

Northwest Africa 968 (NWA 968)
(Northwest Africa)
Found: unknown
Classification: Iron meteorite (IAB-sLH)

Petrography (J. Wasson, *UCLA*): Iron with silicates (roughly 30% of area). There is extensive corrosion, up to 1.7 mm. Kamacite bandwidth 80±20 µm. Numerous patches (~5 mm across) have different octahedral orientations. Taenite well developed. Dark plessite is acicular. Silicates intimately mixed with FeS.

Geochemistry: Co (mg/g) 5.45, Ni (mg/g) 132.5, Ga (µg/g) 26.8, Ge (µg/g) <200, As (µg/g) 21.9, Ir (µg/g) 1.96, Au (µg/g) 1.72

Northwest Africa 1611 (NWA 1611)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IAB-MG)

Petrography: Sample is an octahedrite, probably a coarse octahedrite with bandwidth poorly determined to be 1.6 mm + 0.7 mm or -0.5 mm. Sample consists almost entirely of kamacite. A few dark plessite fields, maybe 2% of the total area, are highly elongated. A mineral along some kamacite boundaries appears to be schreibersite.

Geochemistry: Co (mg/g) 4.68, Ni (mg/g) 67.4, Ga (µg/g) 84.9, Ge (µg/g) 303, As (µg/g) 13.5, Ir (µg/g) 1.81, Au (µg/g) 1.55.

Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 2311 (NWA 2311)
(Northwest Africa)
Found: 2004
Classification: Iron meteorite (IAB-sLL)

Petrography: Relatively unweathered. Tiny schreibersite bands mark edges of some kamacites and intersections between crossing bands. No FeS is visible. Most plessite fields are dark, matte. One slice contains a centimeter-sized angular silicate clast.

Geochemistry: Co (mg/g) 4.87, Ni (mg/g) 97.8, Ga (µg/g) 61.8, Ge (µg/g) 206, As (µg/g) 15.9, Ir (µg/g) 1.64, Au (µg/g) 1.78.

Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 2676 (NWA 2676)
Morocco
Found: 2004
Classification: Mesosiderite

Petrography: Low-Ca pyroxene is pigeonitic; $Fs_{27.}Wo_{5.7}$ (n=5) ranges: $Fs_{25.3\text{-}28.6}Wo_{1.1\text{-}9.5.}$ Plagioclase is anorthitic, mean $An_{94.0}Or_{0.28}$ (n=5) ranges $An_{93.3\text{-}94.5}Or_{0.24\text{-}0.33.}$ The rock also contains silica with an open structure (high content of minor elements). Approximate proportions: 70% pyroxene, 25% plagioclase, 5% silica. Metal: silicate ratio is about 50:50 by volume

Geochemistry: Co (mg/g) 4.67, Ni (mg/g) 83.9, Ga (µg/g) 12.4, Ge (µg/g) <100, As (µg/g) 9.71, Ir (µg/g) 4.34, Au (µg/g) 1.036

Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 2678 (NWA 2678)
Morocco
Purchased: 2004
Classification: Iron meteorite (IIAB)

Petrography: Ni-poor ataxite, equiaxed ~0.1 mm crystals; one region shows ghost bands ~0.5 mm wide. No inclusions recognized.

Geochemistry: Co (mg/g) 4.47, Ni (mg/g) 54.5, Ga (µg/g) 58.0, Ge (µg/g) ~160, As (µg/g) 3.83, Ir (µg/g) 21.70, Au (µg/g) 0.527.

Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 2679 (NWA 2679)
Morocco
Found: 2004
Classification: Iron meteorite (IAB-sHL)

Petrography (J. Wasson, *UCLA*): Observations based on two regions with 25 cm^2 area. Attractive Widmanstätten pattern. Kamacite bandwidth ~0.15 mm (Off). Kamacite bands have high aspect ratios and are irregular in width, becoming much thicker (up to 0.5 mm) when they enclose small schreibersite grains. Two large (8-9 mm) skeletal schreibersite masses are surrounded by swathing kamacite ~0.7 mm thick. Modal abundance of schreibersite ~0.4 vol%. No other inclusions recognized.

Geochemistry: Co (mg/g) 5.59, Ni (mg/g) 111.8, Ga (µg/g) 12.9, Ge (µg/g) <60, As (µg/g) 32.3, Ir (µg/g) 0.174, Au (µg/g) 3.28

Northwest Africa 2680 (NWA 2680)
Morocco
Purchased: 2005
Classification: Iron meteorite (IAB-sLH)

Petrography: Silicate-rich iron with 60-65 vol% metal which mainly consists of small domains each with a differently oriented octahedral pattern; typical size 0.6 to 1.0 cm. Within the domains, kamacite forms narrow lamellae with high (10-20) aspect ratios. Widest bands are ~0.15 mm, thus the metal structure is Off. Most domains are surrounded by swathing kamacite 0.2-0.3 mm thick. Angular silicate blocks are abundant, comprising 10-15 vol%; largest clast 5x1.5 mm. FeS also abundant, ~10 vol%. Schreibersite not confirmed. Based on structure, possibly paired with NWA 4024 and 5980 that are described as winonaites.

Geochemistry: Co (mg/g) 5.36, Ni (mg/g) 136.6, Ga (µg/g) 24.3, Ge (µg/g) <140, As (µg/g) 19.4, Ir (µg/g) 2.04, Au (µg/g) 1.73.

Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 2743 (NWA 2743)

Morocco
Found: 2005
Classification: Iron meteorite (IC)

Petrography (J. Wasson, *UCLA*): Compositionally identical to Chihuahua City. The observed area is 55 cm^2. Irregular kamacite bands ~2 mm thick are partly resorbed to create wider bands. Some schreibersite present at grain boundaries. Several FeS-graphite (?) inclusions were noted.
Geochemistry: Co (mg/g) 4.76, Ni (mg/g) 67.5, Ga (µg/g) 52.6, Ge (µg/g) 195, As (µg/g) 8.28, Ir (µg/g) 0.127, Au (µg/g) 0.971

Northwest Africa 3200 (NWA 3200)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IAB-sHL)

Petrography: Fine octahedrite, fresh appearing but no heat-altered zone. Kamacite (width ~0.4 mm) often forms bundles of ~5 parallel lamellae. Equiaxed schreibersite grains (0.1-0.2 mm) in centers of many kamacites. Large schreibersite 11 x 0.5 mm crossed by some kamacite bands. No FeS recognized.
Geochemistry: Co (mg/g) 5.53, Ni (mg/g) 106.7, Ga (µg/g) 21.8, Ge (µg/g) <80, As (µg/g) 24.7, Ir (µg/g) 0.193, Au (µg/g) 2.35.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 3201 (NWA 3201)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IIAB)

Petrography: Coarsest octahedrite; total area examined is ~500 cm^2. Schreibersite comprises ~8% of the area. No troilite was recognized. Meteorite shows halos around large schreibersite crystal implying reheating sufficient to cause diffusion of P into kamacite. No heat altered zone.
Geochemistry: Co (mg/g) 5.11, Ni (mg/g) 52.1, Ga (µg/g) 51.6, Ge (µg/g) 130, As (µg/g) 11.1, Ir (µg/g) 0.017, Au (µg/g) 1.09.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 3202 (NWA 3202)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IIAB)

Petrography: Hexahedrite shows some tiny stress cracks. Rhabdites reach 1 mm in length; distribution is patchy. No FeS recognized on face with area of ~9 cm^2. No heat-altered zone.
Geochemistry: Co (mg/g) 4.51, Ni (mg/g) 56.1, Ga (µg/g) 58.9, Ge (µg/g) 162, As (µg/g) 4.14, Ir (µg/g) 11.4, Au (µg/g) 0.57.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 3204 (NWA 3204)
(Northwest Africa)
Find date unknown
Classification: Iron, IAB-sHL-an

Petrography: Meteorite is relatively fresh, has a strange shape, like a 200° arc of a US doughnut. Cut face area is about 9 cm^2. A large V-shaped schreibersite has 10 mm and 6 mm arms with thicknesses from 1 to 2 mm. Host has plessitic texture, with sparks and spindles occupying ~60% of the area, dark, matte plessite the remainder; the maximum length and width of spindles is 1, 0.05 mm, respectively.
Geochemistry: Co (mg/g) 5.85, Ni (mg/g) 114.8, Ga (µg/g) 34.7, Ge (µg/g) 170, As (µg/g) 25.6, Ir (µg/g) 0.147, Au (µg/g) 2.76.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 3205 (NWA 3205)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IAB, ungrouped)

Petrography: Polished, etched 4x3 cm face of main mass. Moderately weathered, no heat-altered zone. Beautiful octahedral structure. Bands ~1 cm long, have 0.05 mm dots of schreibersite in interiors. Kamacite wider near schreibersites. One large inclusion 13x4 mm has schreibersite, troilite and possibly graphite. Plessite, mostly fine, covers ~40% of area.
Geochemistry: Co (mg/g) 8.09, Ni (mg/g) 117.1, Ga (µg/g) 33.3, Ge (µg/g) 52, As (µg/g) 16.9, Ir (µg/g) 14.8, Au (µg/g) 1.79.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 3206 (NWA 3206)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IAB-sLH)

Petrography: Meteorite has a fine, uniform plessitic texture; there is no pattern, so it is best classified as an ataxite. It is compositionally a member of IAB-sLH whose other members show octahedral structures. The meteorite is nearly identical in composition to LEW 86540 which exhibits a pattern with bandwidth of ~0.03 mm.
Geochemistry: Co (mg/g) 5.97, Ni (mg/g) 195.2, Ga (µg/g) 3.52, Ge (µg/g) <80, As µg/g) 28.5, Ir (µg/g) 0.049, Au (µg/g) 1.80.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 3208 (NWA 3208)
(Northwest Africa)
Find date unknown
Classification: Iron meteorite (IIIAB)

Petrography: Strongly weathered iron, no heat-altered zone. Structure visible upon polishing, less clear upon etching. Kamacite bandwidth ~0.9 mm. Shear-produced offset of ~1 mm in bands near one edge of small (36x14 mm) section. No inclusions, consistent with very high Ir content, at extreme of IIIAB.
Geochemistry: Co (mg/g) 4.95, Ni (mg/g) 75.8, Ga (µg/g) 17.7, Ge (µg/g) <50, As (µg/g) 3.25, Ir (µg/g) 18.9, Au (µg/g) 0.48.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4217 (NWA 4217)
(Northwest Africa)
Purchased: 2006
Classification: Iron meteorite (IAB-MG)

Petrography: Sample has abundant silicates; compositionally the same as Campo del Cielo; structure not studied in detail.
Geochemistry: Co (mg/g) 4.33, Ni (mg/g) 68.8, Ga (µg/g) 81.7, Ge (µg/g) 409, As (µg/g) 10.5, Ir (µg/g) 3.49, Au (µg/g) 1.346.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4448 (NWA 4448)
Morocco
Found: 2005
Classification: Primitive achondrite (lodranite)

History: A stone was recovered from the lower Algerian desert in 2005 and sold in Erfoud, Morocco, in 2006.
Physical characteristics: A partially crusted, 36.3 g stone with a freshly fractured surface.
Petrography: (T. Bunch and J. Wittke, *NAU*): granoblastic texture with a grain size of 0.05 to 1.7 mm, mean=0.55 mm. The largest grains are orthopyroxene oikocrysts that enclose rounded olivine chadacrysts. Modal analyses (in vol. %): orthopyroxene, 49 (oikocrysts=4); olivine, 42; metal, 6; sulfide, chromite, and phosphates, 3. Weathering grade and the shock level are low.
Geochemistry: Orthopyroxene, $Fs_{11.0}Wo_{2.2}$, FeO/MnO=16-18; orthopyroxene oikocrysts, $Fs_{10.6}Wo_{1.6}$; olivine, $Fa_{8.5}$, FeO/MnO=19 to

23; sulfide Ni=2.36 wt %; metal Ni=5.4 wt %; chromite cr#=80; merrillite CaO=47.5 wt % and P_2O_5=46.3 wt %; apatite CaO=56.9 wt % and P_2O_5=42.4 wt %; Oxygen isotopes (D. Rumble, *CIW*): A cleaned and metal-free sample was analyzed by laser fluorination. Replicate analyses are, respectively, $\delta^{17}O$ of -0.539 and -0.442‰; $\delta^{18}O$ of 3.551 and 3.413‰; $\Delta^{17}O$ of -1.329 and -1.353‰.
Classification: Achondrite (lodranite).
Specimens: 6.3 g and one thin section are on deposit at *NAU*. The main mass is held by Mr. Aziz Habibi.

Northwest Africa 4700 (NWA 4700)
(Northwest Africa)
Purchased: 2007
Classification: Iron meteorite (IAB-sLL)
Petrography: Large schreibersite visible on top and bottom surfaces of 4 mm slice. No FeS observed. Kamacite contains abundant rhabdites. No silicates recognized. Bandwidth variable, 1.0 to 1.6 mm. Presumably purchased at same time as the very similar NWA 4703.
Geochemistry: Co (mg/g) 5.00, Ni (mg/g) 80.0, Ga (µg/g) 75.4, Ge (µg/g) 349, As (µg/g) 17.0, Ir (µg/g) 2.75, Au (µg/g) 1.84.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4701 (NWA 4701)
(Northwest Africa)
Purchased: 2007
Classification: Iron meteorite (IAB complex)
Physical characteristics: A weathered, but slow to rust sample (top and bottom faces each ~4x5 cm) with total area of about 35 cm^2.
Petrography: Ataxite; no octahedral pattern but a fine pattern is visible at high magnification. One 4 mm schreibersite observed.
Geochemistry: Co (mg/g) 6.07, Ni (mg/g) 169.3, Ga (µg/g) 8.8, Ge (µg/g) <80, As (µg/g) 34.1, Ir (µg/g) 0.0190, Au (µg/g) 3.20.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4702 (NWA 4702)
(Northwest Africa)
Purchased: 2007
Classification: Iron meteorite (ungrouped)
Petrography: A fresh looking sample; no octahedral pattern visible; thus an ataxite. On a deeply etched surface are fine, quasi-straight lines 0.05 to 0.1 mm long, 0.005 mm wide. They do not seem to be regularly oriented. These could be artifacts produced by the surface preparation.
Geochemistry: Co (mg/g) 4.37, Ni (mg/g) 54.3, Ga (µg/g) 44.6, Ge (µg/g) 110, As (µg/g) 6.00, Ir (µg/g) 0.093, Au (µg/g) 0.70.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4703 (NWA 4703)
(Northwest Africa)
Purchased: 2007
Classification: Iron meteorite (IAB-sLL)
Petrography: Etched surface is curious: some bands mirror-like in their brightness, others dull. Differences depend on crystallographic orientation because dull crosses bright. Abundant Neumann lines. One 3x9 mm FeS inclusion. Silicates and schreibersite not identified.
Geochemistry: Co (mg/g) 4.79, Ni (mg/g) 85.2, Ga (µg/g) 76.9, Ge (µg/g) 269, As (µg/g) 16.6, Ir (µg/g) 2.78, Au (µg/g) 1.82.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4704 (NWA 4704)
(Northwest Africa)
Purchased: 2007
Classification: Iron meteorite (IIIE)
Petrography: Bands are short, swollen, but no inclusions visible in the centers. No FeS or schreibersite identified. Sample crossed by small cracks showing oxidation (very minor) at edges. Plessite, mainly dark gray or finely banded, is abundant, ~33% of area. No heat altered zone. Kamacite bandwidth ~0.7 mm.
Geochemistry: Co (mg/g) 4.89, Ni (mg/g) 89.0, Ga (µg/g) 17.5, Ge (µg/g) <60, As (µg/g) 4.73, Ir (µg/g) 0.149, Au (µg/g) 0.86.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4705 (NWA 4705)
(Northwest Africa)
Purchased: 2006
Classification: Iron meteorite (ungrouped)
Petrography: A small, plessitic octahedrite. Kamacite sparks and spindles have schreibersite in centers and thin taenite borders. Some spindles are very reflective, mirror like, similar to carbides. No FeS was observed. No heat-altered zone is preserved. Kamacite bandwidth 0.010±0.004 mm.
Geochemistry: Composition is exceptional, with high concentrations of almost all elements. Co (mg/g) 13.19, Ni (mg/g) 200.1, Ga (µg/g) 15.0, Ge (µg/g) 1300, As (µg/g) 32.8, Ir (µg/g) 58.9, Au (µg/g) 3.25.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4706 (NWA 4706)
(Northwest Africa)
Purchased: 2006
Classification: Iron meteorite (IAB-sHL)
Petrography: Fine octahedrite, attractive. There is much fine plessite, 40-50% of the area. Schreibersite is present as small, 0.2 mm wide, 0.3 to 0.5 mm long, grains in the centers of wide kamacites, and is especially abundant at intersections of kamacite bands. No troilite observed. Paired with NWA 4710 and NWA 3200; kamacite bandwidth 0.4±0.1 mm.
Geochemistry: Co (mg/g) 5.49, Ni (mg/g) 107.8, Ga (µg/g) 22.0, Ge (µg/g) 67, As (µg/g) 23.5, Ir (µg/g) 0.194, Au (µg/g) 2.34.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4707 (NWA 4707)
(Northwest Africa)
Purchased: 2006
Classification: Iron meteorite (IIIAB)
Petrography: Well-defined structure with relatively abundant taenite. No heat altered zone. Heavily oxidized along one edge of section. Fresh with no oxide layer along the opposite edge. Tiny grains in some kamacite and plessite may reflect minor post-shock annealing. No FeS observed and schreibersite content very low. Kamacite bandwidth ~0.7 mm.
Geochemistry: Co (mg/g) 5.18, Ni (mg/g) 81.8, Ga (µg/g) 22.1, Ge (µg/g) <70, As (µg/g) 6.71, Ir (µg/g) 0.748, Au (µg/g) 0.87.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4708 (NWA 4708)
(Northwest Africa)
Purchased: 2006
Classification: Iron meteorite (IIIAB)
Geochemistry: Co (mg/g) 5.07, Ni (mg/g) 78.9, Ga (µg/g) 20.0, Ge (µg/g) <80, As (µg/g) 4.88, Ir (µg/g) 3.86, Au (µg/g) 0.679.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4709 (NWA 4709)
(Northwest Africa)
Found: 2007
Classification: Iron meteorite (IAB-MG)
Geochemistry: Co (mg/g) 4.65, Ni (mg/g) 69.1, Ga (µg/g) 90.1, Ge (µg/g) 475, As (µg/g) 11.2, Ir (µg/g) 2.13, Au (µg/g) 1.52.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4710 (NWA 4710)
(Northwest Africa)
Purchased: 2006
Classification: Iron meteorite (IAB-sHL)
Petrography: Possibly paired with NWA 4706 and very similar in structure; description of NWA 4706 applies to 4710.
Geochemistry: Co (mg/g) 5.49, Ni (mg/g) 107.8, Ga (µg/g) 22.0, Ge (µg/g) 67, As (µg/g) 23.5, Ir (µg/g) 0.194, Au (µg/g) 2.34.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4711 (NWA 4711)
(Northwest Africa)
Purchased: 2007
Classification: Iron meteorite (IAB-sHL)
Petrography: Relatively fresh looking with pronounced octahedrite structure; kamacite bandwidth of 1.2±0.2 mm places it near the Om-Og boundary. Bands irregularly swollen but no interior inclusions were recognized. Smaller kamacites densely decorated with Neumann lines. Larger kamacites show granulation. Schreibersite and FeS not present.
Geochemistry: Co (mg/g) 5.26, Ni (mg/g) 107.3, Ga (µg/g) 21.3, Ge (µg/g) <50, As (µg/g) 20.4, Ir (µg/g) 0.429, Au (µg/g) 2.34.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4713 (NWA 4713)
(Northwest Africa)
Found: 2007
Classification: Iron meteorite (IAB-sLM)
Petrography: The *UCLA* sample is half of an oblate spheroid ~3 cm in diameter and 1 cm thick. The surface is covered by iron oxides. The deep-etched surface shows no octahedral pattern, and thus is a heated and recrystallized structure. There are many small (0.05 to 0.15 mm) irregular holes (or clumps of holes) scattered uniformly in the metal. The areal density is about 1 mm^{-2} and thus ~1 vol%. The meteorite is a member of sLM with Maltahöhe its nearest relative; thus its structure differs markedly from the very attractive Of structures of the other irons in this subgroup.
Geochemistry: Co (mg/g) 5.30, Ni (mg/g) 144.5, Ga (µg/g) 33.6, Ge (µg/g) <80, As (µg/g) 19.2, Ir (µg/g) 0.909, Au (µg/g) 1.61.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 4741 (NWA 4741)
(Northwest Africa)
Found: unknown
Classification: Ungrouped achondrite
History: One single stone purchased in Erfoud, June 2005.
Physical characteristics: The stone measures 40×20×15mm and weighs 20 g. It is 70% covered with dark brown fusion crust and discrete regmaglypts. The interior is light gray and fine grained.
Petrography: (A. Jambon, O. Boudouma, D. Badia, *UPVI*; J-A Barrat and M. Bohn, *UBO*). Dominant olivine and low-Ca pyroxene exhibit thin, iron-enriched rims at the contact with interstitial glass. Troilite, chromite, kamacite, taenite, and augite are also present. The sample is partly brecciated and shock melted. Some crystals of olivine and pyroxene have serrated overgrowths a few micrometers wide. Mode (vol %): olivine=24%; pyroxene=64%; glass=6 %; voids 4%; accessories 2%.
Geochemistry: Olivine: Fo_{97}, FeO/MnO=20. Enstatite: $En_{94}Fs_5Wo_1$, FeO/MnO=19. Major elements by ICP-AES and trace element composition by ICP-MS (J.-A. Barrat *UBO*): silicic-feldspathic glass: SiO_2=76-68 wt%; Al_2O_3=6-13 wt%; FeO=4-7 wt%; CaO=2-10 wt%; Na_2O=1-4 wt%; K_2O=0.7-0.2 wt%. Bulk composition: SiO_2 =52.7 wt%; MgO=37.3 wt%; FeO=6.06 wt%; NiO=0.1 wt%. Incompatible elements abundances close to chondritic. Light REE depleted pattern with La/Lu=0.57×chondritic. Negative Eu anomaly, Eu*/Eu=0.60. Anomalous ratio of Na/K=3.0 (by wt). Oxygen Isotopes (R. Greenwood and I. Franchi, *OU*): $\delta^{18}O$=4.99 ‰, $\delta^{17}O$=2.64 ‰, $\Delta^{17}O$=0.047 ‰.
Classification: Achondrite (ungrouped). Only marginally weathered. Shock melted.
Specimens: A total sample mass of 5 g and one polished section are on deposit at *UPVI*. An anonymous collector holds the main mass.

Northwest Africa 4908 (NWA 4908)
(Northwest Africa)
Purchased: Prior to 2004
Classification: HED achondrite (Eucrite)
History: Believed by *Thompson* to have been originally found near Erfoud, Morocco. A portion of the sample was donated to *Cascadia* on May 3, 2004.
Physical characteristics: The sample is partly covered with a shiny black fusion crust; broken surfaces are gray or have a brown patina that appears to contain brownish-red dust. Cut surfaces show sharply-defined angular to subrounded gray clasts and more diffuse blue-gray clastic areas set in a buff-colored host.
Petrography: (A.Ruzicka and T.J. Schepker, *Cascadia*) Microscopic inspection reveals the buff areas to be microcrystalline and feldspathic, and the blue-grey areas to be feldspathic and cryptocrystalline to microcrystalline. Larger lithic and mineral clasts (<20% of the sample) are composed mainly of plagioclase and exsolved clinopyroxene, with lithic clasts composed of basalt.
Geochemistry: (A. Ruzicka and T.J. Schepker, *Cascadia*) Plagioclase has relatively uniform composition ($Ab_{10.8\pm0.3}An_{88.8\pm0.3}Or_{0.5\pm0.1}$, n=42) and exsolved pyroxene endmembers include orthopyroxene ($Wo_{4.2\pm0.4}En_{37.1\pm0.4}Fs_{58.7\pm0.4}$, FeO/MnO=31.4, n=21) and augite ($Wo_{41.1\pm1.1}En_{30.3\pm0.3}Fs_{28.5\pm1.0}$, FeO/MnO=33.4, n=5). Oxygen isotopes: (E. Martin and I. Bindeman, *UOr*) $\delta^{18}O$=4.025, $\delta^{17}O$=1.931, $\Delta^{17}O$=-0.183 (mean of two analyses). Replicate analyses of standards suggest ±0.080 per mil error on $\delta^{18}O$ and ±0.027 per mil error on $\Delta^{17}O$.
Classification: Achondrite (Eucrite), crystalline melt breccia. Weathering is minor.
Specimens: A total of 22 g and 7 thin sections are on deposit at *Cascadia*. *Thompson* holds the main mass.

Northwest Africa 5349 (NWA 5349)
(Northwest Africa)
Purchased: Jan 2008
Classification: HED achondrite (Eucrite, polymict)
History: The main mass holder purchased the sample in Zagora, Morocco.
Physical characteristics: This meteorite consists of a single stone weighing 445 g. Dark fusion crust covers one rounded side, while the other side is an irregular broken surface. Light-colored (white, beige) and black inclusions set in a dark gray matrix are visible in both the broken exterior and cut interior surfaces.
Petrography: (Melinda Hutson and Alex Ruzicka, *Cascadia*). In thin section, this meteorite shows lithic and mineral clasts, which vary in size and texture set in a groundmass of angular grains. The three largest clasts (3-5 mm) are basaltic with mineral grains and clasts set in a granular matrix. Smaller clasts are mainly basaltic with textures varying from granular to subophitic. Large low-Ca pyroxene mineral clasts that comprise a diogenitic component are present and make up less than 10% of the section. Large feldspar mineral clasts (0.2-1 mm) are present. These feldspar clasts display a variety of textures, including triple junctions, clear twinned feldspar intergrown with cloudy feldspar, grains displaying mosaic extinction, and twinned feldspars with microfaults. No maskelynite was observed, but notable shock effects in low-Ca pyroxene (mosaic extinction) and plagioclase (recrystallization)

are evident. Six clasts larger than 0.1 mm are largely opaque in transmitted light and contain silicate subclasts as well as many tiny oxide and sulfide inclusions (droplets and veins). A silicate vein containing small rounded opaques is interpreted as a shock vein. A couple of metal grains with minor oxide rims (weathering products) were observed.

Geochemistry: (Melinda Hutson and Alex Ruzicka, *Cascadia*; Ilya Bindeman, *UOr*). EMPA analyses: Mg-rich low-Ca pyroxene ($Wo_{1.6\text{-}5.3}$ $En_{60.5\text{-}78.1}$ $Fs_{20.0\text{-}36.8}$) Fe/Mn=29.9±1.8; intermediate low-Ca pyroxene ($Wo_{1.0\text{-}4.0}$ $En_{49.3\text{-}55.4}$ $Fs_{41.0\text{-}48.8}$) Fe/Mn=32.1±0.8; Fe-rich low-Ca pyroxene ($Wo_{1.6\text{-}4.7}$ $En_{30.0\text{-}40.6}$ $Fs_{55.9\text{-}66.0}$) Fe/Mn=31.1±0.8; pigeonite ($Wo_{5.6\text{-}19.1}$ $En_{31.3\text{-}48.4}$ $Fs_{41.0\text{-}60.6}$) Fe/Mn=31.7±1.3; and augite ($Wo_{42.1\text{-}43.5}$ $En_{28.0\text{-}30.1}$ $Fs_{27.9\text{-}29.4}$) Fe/Mn=34.1±2.5; plagioclase ($An_{88.4\pm2.7}$, $Ab_{11.3\pm2.5}$, n=33). Oxygen isotopes (whole rock): $\delta^{18}O$=3.80±0.03 ‰, $\delta^{17}O$=1.73±0.06 ‰, and $\Delta^{17}O$=-0.264±0.045 ‰ .

Classification: Achondrite (polymict eucrite). Minimal weathering and moderate shock.

Specimens: 21 g and one thin section are on deposit at *Cascadia*. *Thompson* holds the main mass.

Northwest Africa 5350 (NWA 5350)
(Northwest Africa)
Purchased: Jan 2008
Classification: HED achondrite (Howardite)

History: The main mass holder purchased the sample in Zagora, Morocco.

Physical characteristics: This meteorite consists of a single 468 g stone mostly covered by dark fusion crust.

Petrography: (Melinda Hutson and Alex Ruzicka, *Cascadia*). In thin section, this meteorite shows lithic and mineral clasts set in a granular matrix. The clasts are dominantly basaltic, with the two largest clasts consisting of coarse granular basalt containing recrystallized plagioclase and twinned pyroxenes. Both low-Ca pyroxene and plagioclase vary from undeformed to recrystallized with triple junctions. No maskelynite was observed. The section also contains abundant glassy material, including pockets that contain dispersed opaques, devitrified glass shards, and shards of brown-colored bona fide glass. The largest piece of brown glass is ~1 mm. Diogenitic pyroxene mineral clasts make up >10% of the clasts. The largest of these pyroxene clasts (~1.5 mm) is an intermediate composition grain with wormy exsolution. A single cryptocrystalline spherule with microvesicles was observed in thin section. Metal grains vary from unweathered to almost entirely replaced.

Geochemistry: (Melinda Hutson and Alex Ruzicka, *Cascadia*; Ilya Bindeman, *UOr*). EMPA analyses: Mg-rich low-Ca pyroxene ($Wo_{0.6\text{-}4.2}En_{60.6\text{-}79.3}Fs_{19.5\text{-}37.7}$) Fe/Mn=27.2±1.8; intermediate low-Ca pyroxene ($Wo_{1.2\text{-}5.3}En_{55.4\text{-}59.4}Fs_{38.0\text{-}41.8}$) Fe/Mn=30.0±2.2; Fe-rich low-Ca pyroxene ($Wo_{2.0\text{-}4.0}En_{33.7\text{-}45.3}Fs_{50.7\text{-}64.2}$) Fe/Mn=30.8±1.8; pigeonite ($Wo_{5.5\text{-}26.2}En_{26.2\text{-}57.7}Fs_{33.5\text{-}59.7}$) Fe/Mn= 30.4±1.4; augite ($Wo_{40.8\text{-}40.9}En_{28.5\text{-}29.3}Fs_{29.8\text{-}30.7}$) Fe/Mn=33.6±1.1; plagioclase ($An_{90.3\pm2.5}$,$Ab_{9.5\pm2.4}$, n=22). Oxygen isotopes (whole rock): $\delta^{18}O$=3.79±0.10 ‰, $\delta^{17}O$=1.80±0.07 ‰, and $\Delta^{17}O$=-0.191±0.018 ‰

Classification: Achondrite (howardite). Minimal but variable weathering and moderate but variable shock.

Specimens: 28 g and one thin section are on deposit at *Cascadia*. *Thompson* holds the main mass.

Northwest Africa 5351 (NWA 5351)
Erfoud, Morocco
Purchased: Dec 2007
Classification: HED achondrite (Eucrite, monomict)

History: The main mass holder purchased the sample in Tucson from a dealer who told him it was from Erfoud, Morocco.

Physical characteristics: Single, 139 g stone. Dark fusion crust with a rippled texture and shrinkage cracks covers one curved side. The remainder of the exterior consists of a weathered broken surface.

Petrography: (Melinda Hutson and Alex Ruzicka, *Cascadia*). In thin section, this meteorite shows relatively sharply defined, fine-grained basaltic clasts set in a fragmental matrix. The matrix material appears to be comprised of the same material as that found in the clasts. Clasts are mostly subophitic, although some are granular. Feldspathic material includes (1) twinned plagioclase which is either undeformed or which has weak undulose extinction, and (2) a clouded feldspathic phase that does not have the correct stoichiometry for feldspar, but which is not isotropic, so is not glass. No maskelynite was observed.

Geochemistry: (Melinda Hutson and Alex Ruzicka, *Cascadia*; Ilya Bindeman, *UOr*). EMPA analyses: Low-Ca pyroxene ($Fs_{62.6\pm0.7}Wo_{2.5\pm0.6}$, n=21); "pigeonite" ($Fs_{50.5\pm7.3}Wo_{15.4\pm7.6}$, n=11) which is probably a mixture of exsolved low-Ca pyroxene and augite; augite ($Fs_{26.6\pm0.2}Wo_{43.5\pm0.3}$, n=3); Fe/Mn ratios (all at%): low-Ca pyroxene Fe/Mn=31.9±1.4; augite Fe/Mn=32.9±1.1; "pigeonite" (likely mixture) Fe/Mn=31.4±1.1. Plagioclase ($An_{87.9\pm1.9}Ab_{11.7\pm1.8}$, n=22). Oxygen isotopes (whole rock): $\delta^{17}O$=-0.219±0.05 ‰, $\delta^{18}O$=3.70±0.11 ‰

Classification: Achondrite (monomict eucrite). Minimal weathering and shock.

Specimens: 22 g and one thin section are on deposit at *Cascadia*. *Thompson* holds the main mass.

Northwest Africa 5363 (NWA 5363)
(Northwest Africa)
Found: unknown
Classification: Ungrouped achondrite

History: Many pieces bought from nomads in February 2008 (Morocco) totaling 2455 g.

Physical characteristics: Many stones partly covered with a slightly weathered dark brown fusion crust. All the pieces were purchased together at one time and collected by the same nomad.

Petrography (A. Jambon, O. Boudouma and D. Badia, *UPVI*): Olivine is dominant, with augite, chromite and accessory chlorapatite and iron phosphate. Contains troilite and weathered kamacite. Polygonal granular texture.

Geochemistry: Olivine Fa_{29} with FeO/MnO=65, orthopyroxene $En_{73}Fs_{25}Wo_2$, FeO/MnO=41, augite $En_{44}Fs_{10}Wo_{45}$, FeO/MnO=37, chromite Cr/(Cr+Al =0.81. Oxygen isotopes (J. Gattacceca, C. Suavet, C. Sonzogni, *CEREGE*): $\delta^{17}O$ =2.152‰; $\delta^{18}O$=4.183‰; $\Delta^{17}O$=-0.023‰.

Classification: Achondrite (ungrouped), appears to be the same type as NWA 5400. Significantly weathered (W2/3).

Specimens: 32 g of sample and one polished section is on deposit at *UPVI*. Mbark Ait El Caid, Rissani (Morocco) holds the main mass.

Northwest Africa 5492 (NWA 5492)
(Northwest Africa)
Purchased: 2008
Classification: Ungrouped chondrite

History: A 593 g, partially crusted stone, was purchased in Morocco by A. *Aaronson* in 2008 and sold to M. *Farmer* and J. *Strope* in Tucson, Arizona, in February 2009.

Petrography: (T. Bunch and J. Wittke, *NAU*; M. Weisberg, *KCCU*): This stone is a matrix-poor mixture of (given in order of abundance) sub-mm to cm-size "barred" silicate and melt clasts (52 vol%), small Mg-rich cryptocrystalline, radial, and glassy chondrules with minor PP, barred, and POP chondrules and fragments (25 vol%) and rounded to sub-angular metal clumps (23 vol%), and grains of schreibersite, pyrrhotite, and FeS with daubréelite exsolution lamellae. In addition, another section contains a 5 mm chondrite clast with chondrules and fragments <500 μm in size and large angular clasts consisting of a fine-grained intergrowth of enstatite, metal and sulfide. Some clasts are

dominated by quench-crystallized enstatite, Al-diopside, forsterite and feldspathic mesostasis together with metal enclaves. Barred clasts show shock-melted/vesiculated margins and consist of forsterite, enstatite, diopside, feldspathic glass, and metal. Metal lumps typically contain arcuate textures of tiny pyroxenes, forsterite, and FeS grains interstitial to composite metal grains. Weathering grade is W2; shock level variable, S2 to S5.
Geochemistry: Barred silicate clasts: olivine, $Fa_{0.5}$; low-Ca pyroxene, $Fs_{1.2}Wo_{3.1}$ (Al_2O_3=8.4 wt%); diopside, $Fs_{1.4}Wo_{47.1}$ (Al_2O_3=7.3 wt%). Smaller cryptocrystalline chondrules: olivine, $Fa_{0.2\text{-}0.7}$; low-Ca pyroxene, $Fs_{0.1\text{-}0.7}Wo_{0.5.}$ mesostasis glass, Na_2O=2.3 - 2.83 wt % (N= 7). Metal Ni=7.1 wt %. Oxygen isotopes: (D. Rumble, *CIW*) average for 4 analyses of barred silicate clasts (standard deviation): $\delta^{17}O$= -2.13‰, $\delta^{18}O$=0.29‰ and $\Delta^{17}O$= -2.28‰. Average of 6 analyses for the smaller reduced chondrules and fragments (standard deviation): $\delta^{17}O$=2.93‰, $\delta^{18}O$=4.79‰, $\Delta^{17}O$=0.43 ‰.
Classification: Chondrite (ungrouped), type 3. Petrologic characteristics together with the oxygen isotopic data suggest a relationship to CB chondrites for the large barred clasts, whereas the smaller reduced chondrules and fragments have oxygen isotope signatures that suggest a possible relationship to the E chondrites.
Specimens: A total of 20.7 g and one thin section are on deposit at *NAU*. Main mass, M. *Farmer* and J. *Strope*.

Northwest Africa 5549 (NWA 5549)
(Northwest Africa)
Found: unknown
Classification: Iron meteorite (IAB-MG)
Petrography: *UCLA* samples from two masses; in these and in web photos, silicates are common. We examined two sides of a slice with total area 25 $cm^{2.}$ Silicate abundance ~15 vol%, troilite ~1.5 vol%. Kamacite lengths only ~1.5x widths, making width determination uncertain; best estimate 1.6±0.3 mm. Neumann lines abundant. Some silicates contain abundant small metal grains. A few large (3x4 mm) kamacite lamellae with incompletely resorbed taenite.
Geochemistry: Co (mg/g) 4.55, Ni (mg/g) 68.8, Ga (µg/g) 81.6, Ge (µg/g) 370, As (µg/g) 4.1, Ir (µg/g) 4.1, Au (µg/g) 1.49.
Submitter: J. T. Wasson, *UCLA*.

Northwest Africa 5644 (NWA 5644)
(Northwest Africa)
Purchased: Nov 2008
Classification: Ungrouped achondrite
History: Purchased in Erfoud, Morocco, in November, 2008.
Physical characteristics: A light tan to rusty brown, angular single stone devoid of fusion crust, with a total mass of 200 g.
Petrography (Albert Jambon, Omar Boudouma and Dominique Badia, *UPVI*): One polished section of about one cm^2 was studied by EMPA and SEM. The rock is medium grained, composed of light-brown pyroxene (0.2 to 1 mm) and interstitial mm-sized aggregates of plagioclase (0.01 to 0.05 mm) with lobate boundaries against pyroxene, sometimes with poikilitic pyroxene. Clusters of opaques up to several mm are conspicuous on both the sawn and altered surfaces, with poikilitic pyroxene, plagioclase and silica. Rims of Fe-rich olivine occur around pyroxene against ilmenite and spinel. Modes from BSE images (vol%) are: plagioclase 39, pyroxene 54. silica 2, fayalite 1, opaques 3. Contains minor troilite and rare pentlandite. Kamacite and taenite are partly oxidized.
Geochemistry: Pyroxene exhibits well-developed exsolution bands of augite ($En_{25}Fs_{32}Wo_{42}$) and pigeonite ($En_{31}Fs_{63}Wo_6$), but all intermediate compositions are present. The FeO/MnO ratio (73±7) is identical for augite and pigeonite, and distinctly higher than the HED range. Plagioclase is $An_{82\text{-}93.}$ Minor phases are spinel ($Us_{64}Ct_{24}$), ilmenite, olivine (Fa_{80}), metal with up to 55% Ni and badly oxidized, pentlandite and silica. Shock is moderate and, with the exception of the oxidation of metal and sulfide, weathering effects are moderate.
Classification: In its texture, mineral mode and mineral compositions this rock is nearly identical to the achondrite NWA 011, which strongly suggests that these two stones are paired.
Specimens: 21 g and one polished section are on deposit at *UPVI*. A. Habibi holds the main mass.

Northwest Africa 5721 (NWA 5721)
Morocco
Found: 2007
Classification: HED achondrite (Eucrite)
History: A small dark stone was found in SW Morocco (Western Sahara) in 2007 and purchased in Erfoud by an anonymous buyer.
Physical characteristics: A single fresh stone (67.5 g) with a dark gray, partly translucent fusion crust, and containing numerous millimeter-sized vesicles of pre-terrestrial origin.
Petrography: (T. Bunch and J. Wittke, *NAU*; A. Irving, *UWS*): The texture is dominated by long (<12 mm), bladed, dark pyroxenes; some swallow-tailed shapes are present and form lamellar textures with plagioclase, in addition to ophitic to sub ophitic textures. Smaller sub-textures include variolitic and plumose with interstitial poikilitic residuum that contains tiny pyroxenes set in masses of a low birefringent silica phase, iron sulfide (probably troilite), fayalite, metal, ilmenite, and felsic glasses. Pigeonite and augite textures are complex, with large changes in grainsize over short distances. Numerous irregularly shaped, smooth-walled, empty vesicles range in size from 0.2 to 2.5 mm.
Geochemistry: Pigeonite ($Fs_{53.2\text{-}68.1}Wo_{13.5\text{-}8.0}$, FeO/MnO=35), augite ($Fs_{39.4\text{-}44.4}Wo_{32.2\text{-}36.7}$, FeO/MnO=27), olivine ($Fa_{85.7}$, FeO/MnO=48), plagioclase ($An_{82.3\text{-}88.0}$). Oxygen isotopes (D. Rumble, *CIW*): acid-washed material analyzed in replicate by laser fluorination gave, respectively, $\delta^{18}O$=2.93, 2.99; $\delta^{17}O$=1.26, 1.32; $\Delta^{17}O$=-0.281, -0.254 per mil. This composition plots at the lower bound of the field for eucrites. Bulk composition (by ICP-AES and ICPMS, J.-A. Barrat, UBrest): in wt. %, TiO_2 0.58, Al_2O_3 12.49, FeO 19.62, MnO 0.55, MgO 4.07, CaO 10.46, Na_2O 0.43, P_2O_5 0.21; in ppm, La 1.64, Ce 4.24, Nd 3.21, Sm 1.05, Eu 0.47, Gd 1.47, Yb 1.30, Lu 0.20, Rb 0.7, Sr 68, Ba 20, Ni 1.2, Ga 2.8. The chondrite-normalized REE pattern is essentially flat at ~5.4x chondrites, with a small positive Eu anomaly.
Classification: Achondrite (eucrite). Although this specimen has mineral compositions and oxygen isotopic composition similar to those of typical eucrites, it differs from them in the following significant ways: presence of abundant vesicles, low bulk MgO content and very high FeO/MgO ratio (both beyond values for basaltic eucrites, and reflected in the high ferrosilite contents of some constituent pyroxenes), high Ga/Al ratio (~1.75 times higher than in eucrites), rare earth element abundances ~1.65 times lower than those in basaltic eucrites, and much higher abundances of P and Rb than in eucrites. Shock level and weathering grade are both low.
Specimens: 13.8 g and one polished thin section are on deposit at *NAU*. The main mass is held by an anonymous owner.

Northwest Africa 5743 (NWA 5743)
(Northwest Africa)
Purchased: 2009 Feb
Classification: HED achondrite (howardite)
History: Purchased in February 2009 by Adam Hupé from a Moroccan dealer at the Tucson Gem and Mineral Show.
Physical characteristics: A single, uncrusted stone (216 g) containing several varieties of metal-free clasts and distinctive, dark-colored, relatively metal-rich clasts (to 1.5 cm).
Petrography: (A. Irving and S. Kuehner, *UWS*): Heterogeneous fragmental breccia composed of lithic clasts and various mineral

fragments (plagioclase, orthopyroxene, exsolved pigeonite, chromite, taenite). Harzburgitic diogenite clasts (~30 vol%) consist of subequal amounts of olivine and low-Ca pyroxene with accessory chromite and troilite. Metal-rich ultramafic clasts (~30 vol%) consist of strongly zoned olivine and low-Ca pyroxene with 10-15 vol.% metal (kamacite with minor taenite). Sporadic basaltic eucrite clasts consist of prismatic exsolved pigeonite grains, plagioclase laths, clinopyroxene, silica polymorph, chromite, ilmenite, zircon, troilite and Ni-free kamacite.
Geochemistry: Metal-rich ultramafic clast - olivine (core $Fa_{8.7}$, FeO/MnO=59.9, rim $Fa_{35.0}$, FeO/MnO=42.9), low-Ca pyroxene ($Fs_{23.2-30.7}Wo_{1.8-2.1}$, FeO/MnO=31.6-33.9); harzburgitic diogenite clast - olivine ($Fa_{28.0}$, FeO/MnO=52.9), low-Ca pyroxene ($Fs_{22.5}Wo_{2.0}$, FeO/MnO=29.3); basaltic eucrite clast - low-Ca pyroxene host ($Fs_{61.3}Wo_{3.0}$, FeO/MnO=29.6), Ca-pyroxene ($Fs_{32.6}Wo_{38.2}$, FeO/MnO=32.4), plagioclase ($An_{87.2}Or_{0.6}$). Discrete plagioclase mineral clasts are $An_{86.3-90.5}Or_{0.5-0.3}$. Oxygen isotopes (D. Rumble, *CIW*): duplicate analyses of acid-washed samples by laser fluorination gave the following results for different components. Basaltic eucrite clast: $\delta^{18}O$=3.41, 3.41; $\delta^{17}O$=1.53, 1.52; $\Delta^{17}O$=-0.261, -0.273 per mil. Metal-rich ultramafic clast: $\delta^{18}O$=3.55, 3.24; $\delta^{17}O$=1.60, 1.44; $\Delta^{17}O$=-0.266, -0.261 per mil.
Classification: Achondrite (howardite). This breccia is unusual in containing diverse material related to harzburgitic diogenite, cumulate eucrite, basaltic eucrite, and metal-rich ultramafic lithologies. Little, if any, olivine-free diogenitic material appears to be present. The metal-rich ultramafic clasts have oxygen isotope compositions typical for eucrites and diogenites, yet their constituent olivine grains have unusually magnesian cores.
Specimens: 20.1 g and one polished thin section of a complete slice are on deposit at *UWS*. AHupé holds the main mass.

Northwest Africa 5958 (NWA 5958)
SW Morocco
Found: 2009
Classification: C3.0-ung
History: Purchased by Greg Hupé in September 2009 from a Moroccan dealer in Tagounite.
Physical characteristics: A single, fresh, light-gray stone broken into numerous fragments and weighing 286 g.
Petrography: (T. Bunch and J. Wittke, *NAU*; A. Irving and S. Kuehner, *UWS*) The overall texture is fragmental/clastic, with a variety of small objects (mostly 0.05-2.5 mm) set in a dark, fine-grained matrix. Chondrules are predominantly PP, PO, Mg-rich POP and other types. Intact chondrules have multiple (up to 5) accretion rims. Mesostasis is not abundant within chondrules, but where present consists of interlaced quench crystals of fayalite or ferrohortonolite and subcalcic ferroaugite. Some chondrule fragments have discontinuous "veins" of acicular/bladed fayalite. Some PP chondrules contain interstitial grains of carbon (4-16 vol%; grain size=0.001-0.024 mm; some hexagonal or pseudohexagonal in shape). Carbon grains also are found as fragments in the matrix, and forsterite grains have small carbon clumps. Other rare objects are xenoliths of different fine-grained carbonaceous chondrite lithologies, small CAIs and an irregularly shaped 2.5 mm clast of fragmented calcite.
Geochemistry: The overall compositional range for olivine is $Fa_{0.15-88}$ (FeO/MnO=77-148; Cr_2O_3=0.15-0.86 wt.%). Olivine of intact PO chondrule phenocrysts (N=8) is $Fa_{0.15-2.5}$. Olivine in zoned chondrule fragments: rims Fa_{25-58}, mean Fa_{46} (Cr_2O_3=0.23-0.75 wt.%, mean 0.48 wt.%), cores Fa_{10-28} , mean Fa_{21} (Cr_2O_3=0.32-0.86 wt.%, mean 0.54 wt.%). Ferroan olivine is Fa_{68-88}. Enstatite in PP chondrules ($Fs_{0.2-2.5}Wo_{1.3}$); diopside ($Fs_{3.4}Wo_{46}$); subcalcic ferroaugite in enstatite PP chondrule mesostasis ($Fs_{67}Wo_{19}$). Kamacite (Ni=5.5 wt.%, Cr=1.05 wt.%); chromite [Cr/(Cr+Al)=0.94-0.96]; troilite (Ni=2.3 wt.%). Oxygen isotopes (D. Rumble, *CIW*): two acid-washed subsamples analyzed by laser fluorination gave, respectively $\delta^{18}O$ =-8.803, -9.869; $\delta^{17}O$ =-11.398, -12.530 ; $\Delta^{17}O$=-6.768, -7.339 per mil.
Classification: Carbonaceous chondrite (ungrouped, 3.0), S1, W1. This is an unequilibrated chondrite with an extremely ^{16}O-rich bulk oxygen isotopic composition plotting on an extension of the CCAM line.
Specimens: A total of 20.9 g of sample, one polished thin section and a polished thick section are on deposit at *UWS*. The main mass is held by *GHupé*.

Northwest Africa 6077 (NWA 6077)
(Northwest Africa)
Purchased: Sept 2008
Classification: Ungrouped achondrite
History: Purchased September 2008 by John Higgins from a Moroccan dealer in Agadir.
Physical characteristics: A single brownish 1010 g stone.
Petrography: (A. Irving and S. Kuehner, *UWS*) An olivine-rich assemblage with protogranular (possibly cumulate) texture exhibiting triple-junction grain boundaries. Additional minerals include orthopyroxene, clinopyroxene, altered kamacite, chromite, chlorapatite, Ni-bearing troilite and/or pyrrhotite. No plagioclase was found.
Geochemistry: Olivine ($Fa_{30.2-30.7}$), orthopyroxene ($Fs_{24.1-24.5}Wo_{2.1-2.0}$), clinopyroxene ($Fs_{9.4-10.0}Wo_{44.0-43.5}$). Oxygen isotopes (D. Rumble, *CIW*): $\delta^{17}O$ 2.667, 2.932; $\delta^{18}O$ 5.180, 5.536; $\Delta^{17}O$ -0.057, +0.020 per mil
Classification: Achondrite (ungrouped, brachinite-like). Specimen exhibits similar mineralogy and oxygen isotopic composition to NWA 5400, and is likely paired with it.
Specimens: A total of 26.8 g and one polished thin section are on deposit at *UWS*. The main mass is held by Mr. John Higgins.

Northwest Africa 6116 (NWA 6116)
Zagora-Mahmid, Morocco
Purchased: 2002
Classification: Carbonaceous chondrite (CR)
Petrography: Metal-rich CR, many chondrules (only 2 or 3 type II per section) and little matrix (1 μm crystals), refractory inclusions, pure silica beads in the metal and silica rims around chondrules, presence of magnetite and phyllosilicates in glassy matrix-like area, veins of rust.

Northwest Africa 6122 (NWA 6122)
Morocco
Purchased: 2003
Classification: Ordinary chondrite (L5)
Petrography: Shock-induced breccia, interconnected veins, mechanically deformed and elongated metal grains, fractured silicates, no melt pockets. Purchase date is uncertain.

Northwest Africa 6128 (NWA 6128)
Marrakech, Morocco
Purchased: 26 Oct 2005
Classification: Ordinary chondrite (L3.8)
Petrography: Blackening of some silicates. Micro veins of sulfides. Plessitic areas in taenite. Proposed petrologic type 3.8. Small clast of petrologic type 6 is included in the section.

Northwest Africa 6132 (NWA 6132)
Erfoud, Morocco
Purchased: 24 Dec 2008
Classification: HED achondrite (Eucrite)
Petrography: Breccia; granoblastic texture locally ophitic, melted and recrystallised clasts showing skeletic pyroxene crystals.
Geochemistry: Ubiquitous subsolidus exsolutions of Ca-pyx from low-Ca pyx (small trend from $Wo_{2.04}En_{46.54}Fs_{51.42}$ to $Wo_{3.81}En_{37.27}Fs_{58.93}$ in px crystals and up to $Wo_{39.78}En_{32.38}Fs_{27.84}$); ($An_{84-91.9}$%); ilmenite,

chromite, K-rich residual mesostasis, rutile, little metal, silica

Northwest Africa 6133 (NWA 6133)
Erfoud, Morocco
Purchased: 1 Jan 2009
Classification: HED achondrite (Diogenite)
Geochemistry: Coarse-grained low-Ca pyx (about 96.5 vol.% of cm-sized crystals); elongated areas with plagioclase ($An_{79.2-80.45}$) containing up to 2.23 wt% Na_2O and 0.22 wt% K_2O) and smaller pyroxene crystals; px (Fe: 0.156-0.452 and Mn: 0.007-0.017 cations based on 6 oxygens); silica, chromite, ilmenite, phosphates, Fe and FeNi metal; empty fractures; metal shows little alteration. Unshocked.

Northwest Africa 6156 (NWA 6156)
(Northwest Africa)
Purchased: Feb 2010
Classification: Carbonaceous chondrite (CO3.3)
Geochemistry: A. Irving and S. Kuehner (*UWS*): Olivine: $Fa_{1.9-43.1}$ (N=5), mean Fa_{12}, s.d.=18. Low-Ca pyroxene: $Fs_{1.1-12.2}$ (N=4), mean Fs_5, s.d.=5. $\delta^{17}O$ -6.20, -6.61; $\delta^{18}O$ -3.22, -3.42; $\Delta^{17}O$ -4.510, -4.810 (all per mil). Type 3.3 designation based on Cr_2O_3 distribution in ferroan olivine ($Fa_{33.8-43.1}$) per Grossman and Brearley (2005): Cr_2O_3=0.03-0.21 wt.% (N=7), mean 0.08 wt.%, s.d. 0.06 wt.%

Northwest Africa 6162 (NWA 6162)
Northwest Africa
Found: 2009 Mar
Classification: Martian meteorite (Shergottite)
History: A small stone was found in March 2010 near Lbirat in southern Morocco and purchased by Stefan *Ralew* and Martin Altmann.
Physical characteristics: A single very fresh 89 g stone completely coated by black fusion crust with shiny, dark olivine grains visible. The interior is light gray with obvious glassy maskelynite and larger pale yellow grains of olivine, and small pockets of black shock glass.
Petrography: (A. Irving and S. Kuehner, *UWS*): Porphyritic texture. Larger anhedral olivine grains (some in clusters, and containing Cr-rich chromite inclusions) are set in a groundmass composed mostly of pigeonite and plagioclase (maskelynite) with accessory olivine, chromite, pyrrhotite and Mg-bearing merrillite.
Geochemistry: Olivine (core $Fa_{29.6-29.2}$, rim $Fa_{34.9}$, FeO/MnO=48.4-54.2), pigeonite ($Fs_{22.9-28.6}Wo_{5.0-9.7}$, FeO/MnO=27.5-30.4), plagioclase ($An_{62.1-65.8}Or_{0.5-0.3}$). Oxygen isotopes (D. Rumble, *CIW*): acid-washed material analyzed by laser fluorination gave, respectively $\delta^{18}O$=4.68, 3.98; $\delta^{17}O$=2.75, 2.36; $\Delta^{17}O$=0.288, 0.271 per mil. Bulk composition (M. Gellissen, XRF, U. Cologne; C. Herd, ICPMS, *UAb*): powder prepared from clean cutting dust gave the following elemental abundances (in wt.%): SiO_2 46.6, FeO 18.3, MgO 21.8, CaO 5.1; (in ppm) La 0.25, Ce 0.66, Nd 0.61, Sm 0.43, Yb 0.75, Lu 0.12, Ni 220. The rare earth element abundances indicate that this is a depleted shergottite.
Classification: Achondrite (Martian, shergottite, olivine-phyric). This specimen is not paired with other shergottites from northwest Africa, but has mineralogical similarities to Sayh al Uhaymir 005 and pairings found in Oman. This specimen shows no evidence of terrestrial weathering, and is much fresher than most other known depleted olivine-phyric shergottites.
Specimens: A total of 17.8 g of type material, one polished thin section and a polished mount are on deposit at *UWS*; a further 3.2 g is held by J. Jones (*JSC*). The remaining material is held by anonymous collectors and institutions.

Northwest Africa 6163 (NWA 6163)
(Northwest Africa)
Purchased: Oct 2008
Classification: Iron meteorite (ungrouped)
History: A single iron mass was purchased from a Moroccan dealer in October 2008, by M. Graul.
Physical characteristics: The 358 g mass, measuring 70×57×35 mm, has a cone-like shape with a surface roughly flat and one more convex. The surface is partially (>50%) covered by a brown fusion crust and presents several roughly circular depressions up to 1 cm in diameter.
Petrography: (M. D'Orazio, *DST-PI*) Etched sections show a well-preserved heat-affected rim and a peculiar internal structure of sub-equant, 5 to 10 mm kamacite grains with prominent Neumann bands between which are comb-net plessite bodies. Troilite occurs within kamacite as 1 to 6 mm rounded inclusions showing lamellar twinning, whereas schreibersite forms 100 to 500 µm subhedral, elongated crystals often grown at the troilite-kamacite interface. Several inclusions of troilite show, towards their contact with the host kamacite, replacements by chalcopyrite. Many small hollow spaces (from 0.5 to 10 mm in length), sometimes lined with black iron hydroxides, characterize the internal structure of this meteorite. Close to the external surface these cavities are filled with rounded, sand-sized, grains of quartz from the desert soil.
Geochemistry: Composition of the metal (ICP-MS; D'Orazio and Folco 2003) is Co=0.427, Ni=8.43 (both in wt%), Cu=258, Ga=15.1, Ge=54.3, As=11.1, W=1.55, Re=0.48, Ir=4.2, Pt=9.6, Au=1.08 (all in ppm). Reference: D'Orazio, M. and Folco, L. (2003). Chemical analysis of iron meteorites by inductively coupled plasma - mass spectrometry. *Geostandards Newsletter* **27**, 3, 215-225.
Classification: Iron meteorite, ungrouped, with anomalous structure.
Specimens: a 27.7 etched endcut and a 11.8 g etched full slice are on deposit at *DST-PI*. M. Graul holds the main mass.

Northwest Africa 6164 (NWA 6164)
(Northwest Africa)
Purchased: Dec 2007
Classification: Iron meteorite (IAB-MG)
History: A single iron mass was purchased from a Moroccan dealer in December 2007, by M. Graul.
Physical characteristics: The 726 g mass, measuring 88×70×55 mm, has an irregular shape. The portion of the surface originally sitting in the soil is partially covered with light-brown caliche, whereas the remaining portion is glossy dark-brown due to polishing by wind-driven sand. No fusion crust is preserved.
Petrography: (M. D'Orazio, *DST-PI*) Etched sections show a coarse Widmanstätten pattern with kamacite lamellae (bandwidth=1.6±0.2 mm) and comb-net plessite fields in approximately 9:1 volumetric ratio. The heat-affected rim (<1.5 mm) is partially preserved. Kamacite lamellae show abundant Neumann bands and host crystals of cohenite (up to 4 mm in length) with inclusions of schreibersite and taenite.
Geochemistry: Composition of the metal (ICP-MS; D'Orazio and Folco 2003) is Co=0.502, Ni=7.01 (both in wt%), Cu=122, Ga=74, Ge=281, As=14.9, W=1.23, Re=0.205, Ir=1.99, Pt=5.8, Au=1.49 (all in ppm).
Classification: Iron meteorite (IAB, main group), coarse octahedrite.
Specimens: Two etched full slices (12.8 and 7.6 g) and one etched endcut (7.7 g) are on deposit at *DST-PI*. M. Graul holds the main mass.

Northwest Africa 6165 (NWA 6165)
(Northwest Africa)
Purchased: Dec 2003
Classification: Iron meteorite (IAB-sLM)
History: A single small iron mass was purchased in Erfoud, Morocco, in December 2003, by F. Kuntz.
Physical characteristics: The 29 g mass measuring 3.5×1×1 cm is covered by terrestrial iron oxidation products and lacks fusion crust.
Petrography: (M. D'Orazio, M. Gemelli, *DST-PI*) Etched sections

display a fine Widmanstätten pattern of straight kamacite lamellae with a bandwidth of 0.25±0.05 mm. Kamacite lamellae show Neumann bands and sub-boundaries. Schreibersite is common as large skeleton crystals (to 1.5 cm) enveloped in swathing kamacite. They are frequently brecciated and cemented by terrestrial oxidation products. The heat-affected rim (maximum observed thickness 250 µm) is locally very well preserved. Close to the heat-affected rim are found melted schreibersite crystals with dendritic texture and the kamacite is recrystallized into serrated α_2 grains.
Geochemistry: Composition of the metal (ICP-MS; D'Orazio and Folco 2003) is: Co=0.492, Ni=10.8 (both in wt%), Cu=214, Ga=18.0, Ge=24.2, As=21.2, W=0.72, Re=0.03, Ir=0.40, Pt=3.45, Au=1.60 (all in ppm).
Classification: Iron meteorite, fine octahedrite, IAB-sLM, moderate weathering grade.
Specimens: Two etched full slices (3.03 and 2.53 g) are on deposit at *DST-PI*. F. *Kuntz* holds the main mass.

Northwest Africa 6166 (NWA 6166)
(Northwest Africa)
Purchased: 2005
Classification: Iron meteorite (ungrouped)
History: A single iron mass was purchased in Erfoud, Morocco, in 2005 by F. Kuntz (Besançon, France).
Physical characteristics: The 144 g mass measures 5×5×1.5 cm and is lens-shaped. The surface of the meteorite is covered by terrestrial iron oxidation products and lacks fusion crust.
Petrography: (M. D'Orazio, M. Gemelli, *DST-PI*) Etched sections show a microscopic Widmanstätten pattern given by pointed kamacite spindles 30-70 µm wide. Swathing kamacite, nucleated around primary euhedral crystals of schreibersite (100-250 µm in maximum length), is also widespread. The matrix surrounding the kamacite occurs in two different types: some zones have an homogeneous (up to 0.1 mm scale) Ni-rich metal matrix; other zones are made of a rather coarse (10-50 µm) intergrowth of Ni-rich and Ni-poor metal arranged into irregular but continuous ribbons. The heat-altered rim is partially preserved and contains some melted schreibersite crystals showing dendritic structures.
Geochemistry: Composition of the metal (ICP-MS; D'Orazio and Folco 2003) is: Co=0.597, Ni=17.8 (both in wt %), Cu=499, Ga=4.4, Ge=< 1, As=34.5, W=0.02, Re=< 0.01, Ir=0.02, Pt=0.04, Au=1.51 (all in ppm).
Classification: Iron meteorite, structurally anomalous plessitic octahedrite, ungrouped, very low weathering grade.
Specimens: One 14.51 g etched full slice and one 6.92 etched endcut are on deposit at *DST-PI*. *Kuntz* holds the main mass.

Northwest Africa 6167 (NWA 6167)
(Northwest Africa)
Purchased: 2003
Classification: Iron meteorite (ungrouped)
History: A single iron mass was purchased in Erfoud, Morocco, in December 2003, by F. Kuntz (Besançon, France).
Physical characteristics: The 500 g mass, measuring about 7×4×4 cm, has a bullet-shaped morphology with some regmaglypts and remnants of the fusion crust.
Petrography: (M. D'Orazio, M. Gemelli, *DST-PI*) Etched sections show an ataxitic texture. Under high magnification the metal shows a very fine (1-5 µm) intergrowth of kamacite and taenite arranged into a micro-Widmanstätten pattern. Small globular inclusions (to 2 mm) of sulfide-rich material are scattered in the metal. These inclusions are made of a heterogeneous intergrowth of very small (1-10 µm) crystals of kamacite, taenite and schreibersite with interstitial troilite. Some of these inclusions also host small euhedral elongated crystals of chromite. The studied 16.5 cm^2 surface contains five rounded silicate inclusions (to 6.8 mm). They consist of prevailing crystals of olivine ($Fo_{79.6\pm0.6}$), low-Ca pyroxene ($En_{78-80}Wo_{2.2-3.1}$), high-Ca pyroxene ($En_{49-51}Wo_{41-42}$), plagioclase (An_{78-85}), Ca-phosphate and chromite. Close to the boundary with the Fe-Ni metal, the silicate crystals are crossed by tiny veinlets of very fine-grained Fe-Ni metal+troilite or iron oxyhydroxides.
Geochemistry: Composition of the metal (ICP-MS; D'Orazio and Folco 2003) is: Co=0.929, Ni=19.0 (both in wt%), Cu=302, Ga=11.3, Ge=51.4, As=14.5, W=2.68, Re=1.73, Ir=18.7, Pt=26.4, Au=1.12 (all in ppm). Reference: D'Orazio, M. and Folco, L. (2003). Chemical analysis of iron meteorites by inductively coupled plasma - mass spectrometry. Geostandards Newsletter, 27, 3, 215-225.
Classification: Iron meteorite (silicated), Ni-rich ataxite, ungrouped, very low weathering grade.
Specimens: One 21.79 g polished full slice is on deposit at *DST-PI*. *Kuntz* holds the main mass.

Northwest Africa 6204 (NWA 6204)
Great Western Desert, Algeria
Purchased: March 2, 2009
Classification: Ordinary chondrite (L4-6)
History: Originally obtained by Grenville Minerals (Kingston, Ontario) from a Moroccan fossil dealer.
Petrography: Consists of a single cm-scale L6 clast within an L4 matrix. Silicate compositional data are for the L4 portion only.
Specimens: A 20.1 g type specimen plus thin section are on deposit at *UAb*.

Northwest Africa 6205 (NWA 6205)
Morocco
Purchased: 2008
Classification: Ordinary chondrite (L3.3)
Classification: Ferroan chondrule olivine average Cr_2O_3=0.14±0.10 wt% (n=31) indicates minimum type 3.2. Classified as a type 3.3 based on the compositions and texture of olivine and pyroxene.
Specimens: A 6.97 g type specimen, including one thin section, is on deposit at *UAb*.

Northwest Africa 6206 (NWA 6206)
Morocco
Purchased: 2008
Classification: HED achondrite (Howardite)
Petrography: Clastic polymict breccia. Clasts include those dominated by plagioclase (An_{85-93}), zoned pyroxene ($Wo_5En_{64}Fs_{31}$-$Wo_5En_{40}Fs_{55}$), low-Ca pyroxene ($Wo_{13}En_{30}Fs_{57}$) with augite lamellae ($Wo_{32}En_{28}Fs_{40}$), ferroan olivine (Fa_{75-78}), silica, ilmenite, chromite, Fe-Ni metal, and lithic fragments.
Classification: Classified as a howardite based on pyroxene and olivine FeO/MnO ratios (33 and 47, respectively), the diversity of clasts and their similarity to HED lithologies.
Specimens: A 3.03 g type specimen, including one thin section, is on deposit at *UAb*.

Northwest Africa 6234 (NWA 6234)
Mali
Found: 2009
Classification: Shergottite
History: A pale-colored stone found in Mali in 2009 was purchased in February 2010 by an anonymous collector.
Physical characteristics: A fine-grained, partly fusion-crusted stone (55.7 g) displaying fluted abrasion features on several sides. The fresh interior is pale gray with evenly distributed, larger, pale-tan grains, and is crosscut by several thin, black shock veins.
Petrography: (A. Irving and S. Kuehner, *UWS*): Porphyritic texture,

with small (0.15 to 0.35 mm) olivine phenocrysts in a finer grained groundmass composed mainly of prismaticaly zoned pigeonite (with rare subcalcic augite) and maskelynite with accessory ferroan olivine, chromite, titanomagnetite, ilmenite, merrillite and pyrrhotite.
Geochemistry: Olivine phenocrysts (core $Fa_{26.1\text{-}26.5}$, rim $Fa_{39.2}$; FeO/MnO=47.1-56.6), pigeonite ($Fs_{28.5\text{-}38.7}Wo_{5.9\text{-}16.3}$, FeO/MnO=30.3-38.3), augite ($Fs_{23.3}Wo_{35.4}$, FeO/MnO=30.7), groundmass olivine ($Fa_{47.3}$, FeO/MnO=55.0), plagioclase ($An_{52.3\text{-}55.1}Or_{1.8\text{-}2.2}$). Bulk composition (M. Gellissen, XRF, *Koln*; C. Herd, ICPMS, *UAb*): powder prepared from clean cutting dust gave the following elemental abundances (in wt%): SiO_2 44.7, FeO 22.6, MgO 16.3, CaO 6.4; (in ppm) La 1.3, Ce 3.1, Nd 2.0, Sm 1.1, Yb 1.2, Lu 0.17, Ni 540.
Classification: Achondrite (Martian, olivine-phyric shergottite). This specimen has essentially the same external appearance, grainsize, texture and mineral compositions as NWA 2990 and NWA 5960, and evidently is paired with those stones.
Specimens: A total of 20.0 g of type material and one polished thin section are on deposit at *UWS*. The remaining material is held by an anonymous collector.

Northwest Africa 6252 (NWA 6252)
Morocco
Found: 2010
Classification: Lunar meteorite (feldspathic breccia)
History: A 113 g stone (NWA 6252), a 138 g stone (NWA 6554) and a 29.72 g stone (NWA 6555), all partially crusted and minimally weathered, were purchased in Morocco by A. *Aaronson* in 2010. These stone are from the same locality as NWA 2995 and its pairings.
Petrography: (T. Bunch and J. Wittke, *NAU*): Feldspathic breccia containing anorthositic, noritic, gabbros, olivine basalts, troctolites, granulitic breccias, and KREEPy-like lithologies. Breccia-in-breccia structures, impact melts, and veins are common. Moderately to heavily shocked, weathering grade is low.
Geochemistry: Anorthosite plagioclase (An_{94}), olivine basalt olivine ($Fa_{79.9}$, FeO/MnO=97); norite orthopyroxene ($Fs_{25.8}Wo_{3.5}$, FeO/MnO=60). Bulk composition (R. Korotev, *WUSL*): Na_2O 0.39 wt%, FeO 12.9 wt%, Sc 27 ppm, Sm 3.85 ppm, Eu 0.91 ppm, Th 1.40 ppm.
Classification: Achondrite (lunar, feldspathic breccia). Paired with NWA 2995.
Specimens: 20.3 g is on deposit at *NAU*. An anonymous collector holds the main mass.

Northwest Africa 6275 (NWA 6275)
Mauritania
Found: 2009
Classification: Lunar meteorite (feldspathic breccia)
History: Reportedly found in Mauritania and purchased by Norbert Classen in February 2010 from a dealer in Agadir, Morocco.
Physical characteristics: Five small pale-gray stones totaling 1.3 g.
Petrography: (A. Irving and S. Kuehner, *UWS*) Fine-grained recrystallized breccia composed of larger plagioclase grains poikilitically enclosing small grains (<100 μm) of pigeonite, subcalcic augite, olivine, Ti-chromite, ilmenite, troilite and metal.
Geochemistry: Olivine ($Fa_{41.9\text{-}42.3}$, FeO/MnO=81-89), plagioclase ($An_{92.2\text{-}96.7}Or_{0.3\text{-}}$<0.1), pigeonite ($Fs_{31.0\text{-}32.0}Wo_{11.5\text{-}14.1}$, FeO/MnO=62-68), subcalcic augite ($Fs_{19.3\text{-}19.6}Wo_{37.1\text{-}36.9}$, FeO/MnO=50-62). Bulk composition (R. Korotev, *WUSL*): FeO 3.3 wt%, Sc 7.1 ppm, Sm 0.40 ppm, Th 0.11 ppm.
Classification: Achondrite (lunar, granulitic feldspathic breccia). This meteorite has essentially the same texture, mineralogy and mineral compositions as NWA 3163, NWA 4483 and NWA 4881 (which are different portions of one naturally broken mass). The bulk composition of NWA 6275 is somewhat similar to that of the other specimens, although a little more felsic. Yet, given the fine scale mineralogical heterogeneity in all of these specimens, a pairing relationship among all of them seems likely.
Specimens: A 0.3 g polished piece is on deposit at *UWS*. Mr. N. *Classen* holds the remaining material (except for one stone consumed in bulk analyses).

Northwest Africa 6279 (NWA 6279)
Morocco
Purchased: 2009 Aug 20
Classification: Iron meteorite (IIAB)
Petrography: (J. Zipfel, *Senck*) Iron with Ogg structure and cm-sized troilite inclusions.
Geochemistry: Mineral composition and geochemistry: (J. Wasson, *UCLA*) bulk composition (INAA: Ni=64.700, Co=4.86 (mg/g) and Ga=54.9, Au=1.090 (μg/g).

Northwest Africa 6342 (NWA 6342)
Algeria
Purchased: Apr 2010
Classification: Shergottite
History: A small stone was found in Algeria in April 2010 and purchased by Darryl Pitt.
Physical characteristics: A single, dense, unweathered stone (72.2 g), with patches of black fusion crust. The interior is mostly dark grey-green with irregular pale green patches and minor interstitial areas containing microvesicles.
Petrography: (A. Irving and S. Kuehner, *UWS*; T. Bunch and J. Wittke, *NAU*): The specimen is texturally heterogeneous. Some domains exhibit poikilitic texture whereas others do not. Poikilitic domains consist of oikocrysts of pyroxene (mostly pigeonite with some augite) enclosing olivine chadacrysts, with accessory Mg-bearing merrillite, feldspathic intercumulus material, Ti-bearing chromite, ilmenite, pentlandite and pyrrhotite. Feldspathic material (~5 vol.%) occurs in pockets interstitial to mafic silicates, and consists of vesicular glass of intermediate plagioclase composition containing thin, subparallel to fanning, acicular crystals of pigeonite, ilmenite, merrillite, olivine and sulfides (indicative of rapid quenching).
Geochemistry: Olivine ($Fa_{31.4\text{-}34.6}$, FeO/MnO=42.0-56.1), pigeonite ($Fs_{17.4}Wo_{5.5}$ to $Fs_{25.6}Wo_{9.0}$, FeO/MnO=24.6-31.7), subcalcic augite ($Fs_{15.4\text{-}26.1}Wo_{32.3\text{-}31.2}$, FeO/MnO=24.0), plagioclase glass ($An_{48.3\text{-}55.2}Or_{1.5\text{-}0.6}$), chromite (Cr/(Cr+Al)=0.86-0.91). Oxygen isotopes (D. Rumble, *CIW*): acid-washed material analyzed in replicate by laser fluorination gave, respectively $\delta^{18}O$=4.08, 3.97; $\delta^{17}O$=2.44, 2.38; $\Delta^{17}O$=0.292, 0.288 per mil. Bulk composition (C. Herd, ICPMS, *UAb*): duplicate analyses of representative powder prepared from clean wire-saw cutting dust gave the following elemental abundances (in ppm): Cr 3940, Ni 4030, La 0.77, Ce 1.89, Nd 1.50, Sm 0.66, Yb 0.62, Lu 0.09, Hf 0.69.
Classification: Achondrite (Martian, shergottite, ultramafic).
Specimens: 14.5 g of type material, one polished thin section and one polished thick section are on deposit at *UWS*. The main mass is held by *DPitt*.

Northwest Africa 6355 (NWA 6355)
Morocco
Found: June 2009
Classification: Lunar meteorite (feldspathic breccia)
History: Found in southern Morocco in June 2009 and purchased by a consortium led by Matt Morgan from a Moroccan dealer in September 2010.
Physical characteristics: A single fine-grained, brittle stone (760 g) with no obvious fusion crust. The interior is dark gray and resembles devitrified glass with dispersed small white clasts.
Petrography: Clast-laden vitric breccia consisting of fine-grained

mineral debris (mostly pyroxenes, olivine and anorthite) and sparse polycrystalline igneous clasts in a heterogeneous, "swirly" glassy matrix (in part vesicular). Mineral clasts include anorthitic plagioclase, low-Ca pyroxene, pigeonite, olivine, Mg-bearing ilmenite, kamacitic metal and troilite. Lithic clasts include microgabbronorite (composed of subcalcic augite, orthopyroxene, anorthite, Mg-bearing merrillite, silica polymorph, ilmenite, troilite and baddeleyite).
Geochemistry: Low-Ca pyroxene ($Fs_{37.5-61.2}Wo_{2.4-5.2}$, FeO/MnO=65-88), pigeonite ($Fs_{23.5-45.5}Wo_{10.3-11.1}$, FeO/MnO=48-76), subcalcic augite ($Fs_{13.0}Wo_{37.0}$, $Fs_{17.6}Wo_{30.1}$, $Fs_{25.7}Wo_{35.0}$, FeO/MnO=55-59), augite ($Fs_{11.3}Wo_{41.8}$; FeO/MnO=49), olivine ($Fa_{29.5-33.9}$, FeO/MnO=81-104), plagioclase ($An_{91.6-96.1}Or_{0.5-0.1}$). Bulk composition (R. Korotev, *WUSL*): FeO 5.8 wt%, La 13.0 ppm, Sm 6.1 ppm, Yb 3.95 ppm, Th 1.87 ppm.
Classification: Achondrite (lunar, feldspathic breccia). This stone is almost identical in texture, mineral compositions and bulk composition to NWA 4936, NWA 5406 and NWA 6221. It is possibly paired with those stones and is reportedly from the same find location.
Specimens: A total of 20.1 g of sample and one polished thin section are on deposit at *UWS*. The main mass is held jointly by *Morgan*, Abraham, Rose, Curtiss and an anonymous collector.

Northwest Africa 6356 (NWA 6356)
(Northwest Africa)
Purchased: 2005
Classification: Ureilite (polymict)
History: The stone was purchased by H. *Stehlik* in Munich from an anonymous dealer.
Physical characteristics: One piece of 554 g is grayish-brown in color. Fusion crust is absent.
Petrography: (C. Lorenz, *Vernad*). Polymict breccia dominated by fragments of a coarse-grained olivine rock, embedded in fine-grained clastic matrix. Melt rocks, chondrule fragments and carbonaceous chondrite clasts are present. The accessory minerals are pyroxene, feldspar, metal, troilite and chromite. Carbon occurs as graphite and rarely as a dense modification, probably diamond.
Geochemistry: (N. Kononkova, EMP, *Vernad*) Olivine ($Fo_{78.1}$; Fe/Mn=41.6; 0.61 wt% Cr_2O_3; 0.32 wt% CaO) is zoned on the contacts with carbon up to Fo_{95} (Fe/Mn=10); pyroxene ($En_{76.8}Wo_{4.2}$, Fe/Mn=28.9; 1.1-1.5 wt% Cr_2O_3), feldspar ($Ab_{85.8-89.5}An_{3.9-10.7}$). Oxygen isotopic compositions: (I. Franchi, *OU*) $\delta^{18}O$=7.84; $\delta^{17}O$=3.32; $\Delta^{17}O$=0.764.
Classification: Ureilite (polymict), degree of weathering is moderate.
Specimens: A total sample mass of 23 g and one thin section are on deposit at *Vernad*. H. *Stehlik* holds the main mass.

Northwest Africa 6357 (NWA 6357)
(Northwest Africa)
Purchased: Oct 2008
Classification: Carbonaceous chondrite (CV3)
Petrography: (M.A. Ivanova, *Vernad*.) Meteorite consists of fine-grained matrix, chondrules and their fragments and refractory inclusions. The main minerals are olivine and pyroxene. The minor phases are spinel, chromite, sulfides, Fe-Ni metal grains.
Geochemistry: Olivine (EMP) is $Fa_{0.33-14.}$ Pyroxene is represented by low-Ca pyroxene $Fs_{0.9-1.4}Wo_{0.7-3.6}En_{94-98}$ and augite $Fs_{1.9-3.6}Wo_{35-41}En_{55-63.}$ Oxygen isotopic compositions: (I. A Franchi and R. C Greenwood, *OU*, by laser fluorination): $\delta^{18}O$=1.53‰; $\delta^{17}O$=-2.90‰; $\Delta^{17}O$=-3.70‰.

Northwest Africa 6358 (NWA 6358)
(Northwest Africa)
Purchased: Oct 2008
Classification: Carbonaceous chondrite (CV3)
Petrography: (M.A. Ivanova, *Vernad*.) The meteorite consists of fine-grained matrix, chondrules and their fragments, refractory inclusions and isolated grains of minerals. Olivine and pyroxene dominate. The minor phases are plagioclase, spinel, chromite, sulfides, and Fe-Ni metal grains.
Geochemistry: Olivine (EMP) is $Fa_{0.5-10.5.}$ Pyroxene is represented by low-Ca pyroxene $Fs_{1.2}Wo_{0.9}En_{97.9}$, pigeonite $Fs_{1.1}Wo_{7.5}En_{91.4}$ and augite $Fs_{2.5}Wo_{38.3}En_{59.2.}$ Oxygen isotopic compositions: (I. A Franchi and R. C Greenwood, *OU*, by laser fluorination): $\delta^{18}O$=2.95; 2.02; $\delta^{17}O$=-1.90, -2.73; $\Delta^{17}O$=-3.44, -3.78 per mil.

Northwest Africa 6361 (NWA 6361)
Morocco
Purchased: 2004
Classification: Carbonaceous chondrite (CV3)
History: One meteorite found in Morocco was purchased by Mr. H. Stehlik in Munich in 2004.
Physical characteristics: Covered in shiny brown fusion crust, weighs 300 g.
Petrography: (M.A. Ivanova, *Vernad*) Meteorite consists of POP, PO, and BO chondrules (to 3 mm), CAIs (to 4 mm) embedded in a fine-grained matrix. Minor phases include plagioclase, spinel, chromite, sulfides, magnetite, and Fe-Ni metal grains. The metal grains and magnetite are primarily within chondrules, the chondrules rimmed by sulfide. The main minerals of refractory inclusions are spinel, Al-Ti-diopside, mellilite, and anorthite.
Geochemistry: Olivine $Fa_{0.26-11.}$ Pyroxene is represented by low-Ca pyroxene $Fs_{0.9-7.4}Wo_{0.9-4.3}En_{88-98}$ augite and diopside. Oxygen isotopic compositions: (I. A. Franchi and R. C. Greenwood, *OU*, by laser fluorination): $\delta^{17}O$=-2.892, $\delta^{18}O$=1.839, $\Delta^{17}O$=-3.848 (per mil).
Classification: Carbonaceous chondrite (CV3)
Specimens: A total of 25 g sample and one thin section are on deposit at *Vernad*. *Stehlik* holds the main mass.

Northwest Africa 6368 (NWA 6368)
(Northwest Africa)
Purchased: Apr 2009
Classification: Carbonaceous chondrite (CV3)
Petrography: (M.A. Ivanova, *Vernad*.) The meteorite consists of fine-grained matrix, chondrules and their fragments, refractory inclusions (CAIs) and isolated grains of minerals. Large CAIs (to 2 cm) are abundant, and consist of: spinel, mellilite, pyroxene, anorthite and hibonite. The minor phases are plagioclase, spinel, chromite, sulfides, and Fe,Ni metal grains.
Geochemistry: Olivine (EMP) is $Fa_{1-21.}$ Pyroxene is represented by low-Ca pyroxene $Fs_{1-13}Wo_{0.5-5}En_{86-98}$, and augite $Fs_{2-11}Wo_{28-33}En_{60-65.}$

Northwest Africa 6454 (NWA 6454)
(Northwest Africa)
Purchased: February, 2005
Classification: Ordinary chondrite (L, melt rock)
History: In February 2005, Mr. Blaine Reed sold a portion of the sample to Mr. Turecki and that same year pieces were acquired by Cascadia from both Mr. Reed and Mr. Turecki.
Physical characteristics: The single stone is largely covered by a shiny black fusion crust that appears to be relatively unweathered.
Petrography: (A. Ruzicka and Melinda Hutson, *Cascadia*): The meteorite lacks chondritic texture and is dominated by fine-grained (<20 μm) euhedral to subhedral olivine set in glass. Metal and sulfide (~5-10% of sample) form cellular and dendritic intergrowths in composite particles up to a few millimeters across. Silicate portions can be subdivided into coarser, clast-like portions (olivine grain size 5-15 μm across) and finer-grained interstitial areas (olivine grains <3 μm across). Shock veins connect some of the metal-sulfide particles and in places merge into the finer-grained silicate regions. Clasts of olivine and low-Ca pyroxene are present, which show a recrystallization texture

(granular subgrains meeting in triple junctions).
Geochemistry: (K. Hauver and A. Ruzicka, *Cascadia*) Metal consists of kamacite with Ni=6.12±1.54 wt% and Co=0.84±0.06 wt% (N=7); martensite with Ni=12.8±2.9 wt% and Co=0.77±0.10 wt% (N=51), taenite with Ni=27.7±6.8 wt% and Co=0.61±0.11 wt% (N=12), and tetrataenite. Sulfide dominated by troilite with a minor Cr-sulfide phase.
Classification: Ordinary chondrite melt rock (shock melt). Textures of silicate and metal-sulfide particles suggest rapid cooling from a melt and the presence of shock-recrystallized xenocrysts. Kamacite Co contents fall within the range of L chondrites and the overall metal + sulfide content is consistent with this type of protolith.
Specimens: Type specimens available at *Cascadia* include 4 pieces totaling 20.0 g, plus one polished thin section and one polished potted butt. *Turecki* holds the main mass.

Northwest Africa 6467 (NWA 6467)
Morocco
Purchased: September 9, 2009
Classification: Ordinary chondrite (L6)
Petrography: Crosscut by numerous anastamosing shock veins that locally enlarge to >1 mm across. Shock metamorphism is locally greater adjacent to the veins.
Classification: Shock stage based on olivine in areas away from shock veins.
Specimens: A 36.6 g type specimen, including one thin section, is on deposit at *UAb*

Northwest Africa 6470 (NWA 6470)
Morocco
Found: 2009
Classification: Lunar meteorite (feldspathic breccia)
History: Found in southern Morocco in 2009 and purchased by Jason Utas in April 2010 from a dealer in Ouarzazate, Morocco.
Physical characteristics: A fine-grained, dark gray, 96 g stone containing dispersed small white clasts.
Petrography: The specimen consists of small mineral clasts and sparse lithic clasts (some with ophitic textures) in a very fine-grained, heterogeneous, partly glassy and in places vesicular matrix. Mineral clasts include anorthitic plagioclase, subcalcic augite, pigeonite, olivine, Mg-bearing ilmenite, kamacite, baddeleyite and troilite.
Geochemistry: Pigeonite ($Fs_{23.6-26.9}Wo_{16.2-7.0}$, FeO/MnO=51-59), subcalcic augite ($Fs_{21.0}Wo_{36.1}$, FeO/MnO=58), olivine ($Fa_{21.9-29.3}$, FeO/MnO=84-107), plagioclase ($An_{91.6-95.2}Or_{0.5-0.2}$). Bulk composition (R. Korotev, *WUSL*): FeO 5.6 wt%, La 11.1 ppm, Sm 5.0 ppm, Yb 3.24 ppm, Th 1.63 ppm.
Classification: Achondrite (lunar, feldspathic breccia). This stone is very similar in texture, mineral compositions and bulk composition to NWA 4936, NWA 5406, NWA 6221 and NWA 6355. It apparently is paired with those stones and is reportedly from the same find location.
Specimens: A total of 19.2 g of sample are on deposit at *UWS*. The main mass is held by Utas.

Northwest Africa 6481 (NWA 6481)
Morocco
Found: August 2010
Classification: Lunar meteorite (feldspathic breccia)
History: Found on Hamada du Drâa, Morocco, in August 2010 and purchased by Stefan Ralew in November 2010 from a dealer in Ouarzazate, Morocco.
Physical characteristics: A small dark gray stone (13.7 g) lacking fusion crust and containing small white clasts.
Petrography: A fine-grained fragmental breccia composed of mineral clasts, sparse lithic clasts (some with ophitic textures) and rare glass fragments. Mineral clasts include anorthitic plagioclase, subcalcic augite, augite, hedenbergite, pigeonite (some exsolved), olivine, ilmenite, kamacite and troilite.
Geochemistry: Pigeonite ($Fs_{25.8-40.0}Wo_{13.7-12.3}$, FeO/MnO=54-63), subcalcic augite ($Fs_{23.7}Wo_{29.1}$, FeO/MnO=51), augite ($Fs_{16.3}Wo_{43.2}$, FeO/MnO=90), olivine ($Fa_{32.6-33.1}$, FeO/MnO=88-89), plagioclase ($An_{95.1-96.5}Or_{0.1}$). Bulk composition (R. Korotev, *WUSL*): FeO 4.7 wt%, La 3.5 ppm, Sm 1.6 ppm, Yb 1.32 ppm, Th 0.60 ppm.
Classification: Achondrite (lunar, feldspathic breccia).
Specimens: A total of 2.8 g is on deposit at *UWS*. The main mass is held by *Ralew*.

Northwest Africa 6484 (NWA 6484)
(Northwest Africa)
Purchased: June 2010
Classification: Primitive achondrite (Lodranite)
History: Purchased in Sainte Marie (France) in 2010.
Physical characteristics: A greenish-brown 688 g stone without fusion crust.
Petrography: (C. A. Lorenz; *Vernad*) Unbrecciated, medium-grained achondritic rock with equigranular texture composed of olivine and orthopyroxene with minor feldspar and clinopyroxene, and rare Fe-Ni metal, chromite, and troilite.
Geochemistry: (N. N. Kononkova, *Vernad*) EMP data: Olivine $Fo_{88.1}$ (Fe/Mn=21.7); orthopyroxene $En_{85.9}Wo_{2.52}$ (Fe/Mn=13.5; mg#=88); $En_{52.3}Wo_{42.8}$; feldspar $Ab_{75.4}An_{22.7}$- $Ab_{84}An_{13.5}$. Oxygen isotopic composition (Franchi I. A., *OU*, Laser fluorination): $\delta^{17}O$=1.635, $\delta^{18}O$=4.542, $\Delta^{17}O$=-0.727 (per mil).
Classification: Achondrite (lodranite). Moderate weathering.
Specimens: A total of 78.3 g sample and one polished section are on deposit at *Vernad*. The anonymous buyer holds the main mass.

Northwest Africa 6491 (NWA 6491)
(Northwest Africa)
Purchased: Summer 2004
Classification: Rumuruti chondrite (R3-5)
History: Two pieces of the meteorite were donated to *Cascadia* on February 24, 2006.
Physical characteristics: Exterior has a brownish, waxy fusion crust that appears weakly weathered. The interior is brownish-red, with black to light-brown chondritic-textured clasts.
Classification: Rumuruti chondrite (R3-5)
Specimens: Type specimens available at *Cascadia* include 3 pieces that add to 20.6 g, 3 polished thin sections, and one mounted butt. *Thompson* holds the main mass, which now weighs 785 g.

Northwest Africa 6492 (NWA 6492)
(Northwest Africa)
Purchased: Jan 2004
Classification: Rumuruti chondrite (R3-6)
History: A single stone was purchased by Mr. Edwin *Thompson* in January, 2004 and subsequently cut into two pieces. The entire sample was donated to *Cascadia* by Mr. *Thompson* on May 27, 2004. The original mass was estimated to be ~45 g.
Physical characteristics: Exterior is brownish-black, with a waxy fusion crust that appears weakly weathered. The interior is brownish-red, with black to light-brown chondritic-textured clasts.
Classification: Rumuruti chondrite (R3-6)
Specimens: Three pieces of the stone are available at *Cascadia* as a type specimen totaling 40.9 g, in addition to one polished thin section.

Northwest Africa 6514 (NWA 6514)
(Northwest Africa)
Classification: LL(L)3.1
History and Physical characteristics: Since 2009, the type specimen

has been present at the *ROM*.
Petrography: (Levke Kööp, *UTorG*) The main components of this meteorite are chondrules and opaque matrix. Chondrules, chondrule fragments and mineral fragments account for roughly 70% of the total volume. Chondrule diameters range from 0.25 to > 3 mm, with a mean of 0.8 mm. Optically isotropic mesostasis is present in many chondrules. Metal occurs as inclusions in silicate chondrules and in metal-sulfide spherules and nodules. Half of the larger olivine grains show undulatory extinction.
Geochemistry: Olivine ranges from $Fa_{0.3}$ to $Fa_{33.2}$. The mean is $Fa_{12.1}$ (PMD 56%, N=84). Although many olivine grains exhibit FeO poor cores and FeO rich mantles, the mean of grain mantle analyses is also below 15 mol% fayalite. The mean Al_2O_3, Cr_2O_3 and CaO contents in olivine are 0.09 wt%, 0.34 wt% and 0.21 wt% respectively. With a mean of 0.33 wt%, FeO poor olivines (< 2 wt% FeO) are enriched in CaO. The Cr_2O_3 content in ferroan olivines (> 2 wt% FeO) ranges from 0.10 to 0.67 wt%, with a mean of 0.34 wt%. Low-Ca pyroxenes have a mean of $Fs_{12.0}Wo_{1.2}$ and range $Fs_{1.9\text{-}31.6}$.
Classification: The meteorite is an ordinary chondrite (LL or L3). The iron group cannot be inferred from the mean fayalite content in olivine as the meteorite is too unequilibrated. The low metal content (< 3 vol%) and the large chondrule sizes (0.8 mm) suggest that it belongs to either the L or the LL group. Based on the medium Cr_2O_3 levels in ferroan olivines, the meteorite may be classified as a 3.1 subtype. Shock and weathering stages are S2 and W2 respectively, respectively.
Specimens: Type specimen mass of 40 g and consists of a slab (22 g), multiple smaller pieces and two thin sections. All of these are located at the *ROM*. The holder of the main mass (3200 g) is anonymous.

Northwest Africa 6515 (NWA 6515)
(Northwest Africa)
Purchased: 2010
Classification: Ureilite
History: Purchased by Ke Zuokai from a meteorite dealer. The stone is covered by fresh fusion crust.
Petrography: Large grains of pigeonite ($Fs_{14.2}Wo_{12.1}$) and olivine ($Fa_{5.3\text{-}17.3}$) with reduced rims set in a matrix of pigeonite ($Fs_{10.2}Wo_{6.8}$), augite, olivine, troilite, and Fe-Ni-metal. The cores of olivine grains are homogeneous with ~$Fa_{17.1}$, whereas rims near matrix are magnesium-rich with average ~$Fa_{8.8}$. Graphite is present at grain boundaries. Numerous oxide veins and carbonate grains are observed.

Northwest Africa 6542 (NWA 6542)
(Northwest Africa)
Purchased: 2005
Classification: Enstatite chondrite (EL6)
History: A small fragment was purchased at the Bologna Avis Fair by Romano Serra.
Physical characteristics: A single dark brown piece of 15 g with no fusion crust and traces of staining.
Petrography: Vanni Moggi Cecchi, Giovanni Pratesi, Stefano Caporali (*MSP*): The overall texture is characterized by very rare indistinct chondrules set in a fine-grained matrix mainly composed of pyroxene. Several multiple subparallel and anastomozing thin veinlets, about 150 µm long, filled with iron oxides/hydroxides can be observed in the thin section in reflected light. Enstatite accounts for about 90% of the total volume. Relict chondrules are mainly RP type, with minor PP, and range from 0.3 to 0.7 mm in diameter. Opaque phases are mainly altered kamacite (with 0.7 wt.% Si) and troilite (with 5.6 wt. % Ti). Accessory phases are alabandite, schreibersite and daubréelite as blades in troilite. The presence of alabandite and Si content of kamacite point to a classification as EL chondrite.
Geochemistry: Enstatite ($En_{97.8}Wo_{1.5}$), plagioclase ($An_{14.1}Or_{4.2}$).
Classification: Enstatite chondrite (EL6); S1; W3. This specimen is probably paired with NWA 4415 and NWA 4416.
Specimens: A total of 3 g of sample, one polished thin section and a block are on deposit at *MSP*. *OAM* holds the main mass.

Northwest Africa 6554 (NWA 6554)
Morocco
Found: 2010
Classification: Lunar meteorite (feldspathic breccia)
History: A 113 g stone (NWA 6252), a 138 g stone (NWA 6554) and a 29.72 g stone (NWA 6555), all partially crusted and minimally weathered, were purchased in Morocco by A. *Aaronson* in 2010. These stone are from the same locality as NWA 2995 and its pairings.
Petrography: (T. Bunch and J. Wittke, *NAU*): Same general description as given for NWA 2995 and 6252. A feldspathic breccia that contains anorthositic, noritic, gabbros, olivine basalts, troctolites, granulitic breccias, and KREEPy-like lithologies. Breccia-in-breccia structures, impact melts and veins are common. Moderately to heavily shocked, weathering grade is low.
Geochemistry: Anorthosite plagioclase $An_{92.4\text{-}95.6}$; troctolite olivine, $Fa_{32.2}$ (FeO/MnO=96); olivine fragment, $Fa_{36.6}$ (FeO/MnO=89). Chemistry (R. Korotev, *WUSL*): Na_2O=0.44 wt% and FeO=11.3 wt% and trace elements (ppm) Sc=20, Sm=4.11, Eu=0.97, Th=1.38.
Classification: Achondrite (Lunar, feldspathic breccia). Paired with NWA 2995.
Specimens: 20.7 g is on deposit at *NAU*. An anonymous collector holds the main mass.

Northwest Africa 6555 (NWA 6555)
Morocco
Found: 2010
Classification: Lunar meteorite (feldspathic breccia)
History: A 113 g stone (NWA 6252), a 138 g stone (NWA 6554) and a 29.72 g stone (NWA 6555), all partially crusted and minimally weathered, were purchased in Morocco by A. *Aaronson* in 2010. These stone are from the same locality as NWA 2995 and its pairings.
Petrography: (T. Bunch and J. Wittke, *NAU*): Same general description as given for NWA 2995 and 6252. A feldspathic breccia that contains anorthositic, noritic, gabbros, olivine basalts, troctolites, granulitic breccias, and KREEPy-like lithologies. Breccia-in-breccia structures, impact melts, and veins are common. Moderately to heavily shocked, weathering grade is low.
Geochemistry: Anorthosite plagioclase $An_{93\text{-}96.5}$; norite orthopyroxene $Fe24.3Wo_{3.8}$; KREEPy-like basalt plagioclase $An_{35.6}Or_{19.3}$. Chemistry (R. Korotev, *WUSL*) Na_2O=0.38 wt% and FeO=12.2 wt%. Trace elements (ppm) Sc=25, Sm=3.83, Eu=0.92, Th=1.19.
Classification: Achondrite (Lunar, feldspathic breccia). Paired with NWA 2995
Specimens: 6.3 g is on deposit at *NAU*. An anonymous collector holds the main mass.

Northwest Africa 6557 (NWA 6557)
Morocco
Found: 2009
Classification: Primitive achondrite (Acapulcoite)
History: A fresh 68 g stone with fusion crust was purchased by Darryl Pitt from a dealer in Erfoud, Morocco.
Petrography: Equigranular recrystallized texture with triple junctions. Mean grain size is 0.24 mm. Mineral modes (vol%): orthopyroxene, 38; olivine, 35; plagioclase, 12; Ca-pyroxene, 7; opaques, 8. Shock level and weathering grade are low.
Geochemistry: Orthopyroxene, $Fs_{12.5}$ (FeO/MnO=12); olivine, $Fa_{13.9}$ (FeO/MnO=16); plagioclase, $An_{6.8}Or_{5.5}$; chromite, cr#=87; Ca-pyroxene, $Fs_{8.1}Wo_{36.8}$; kamacite (Ni=6.2 wt%). Oxygen isotopes (D. Rumble, *CIW*): replicate analyses of acid-washed material by laser

fluorination gave, respectively $\delta^{17}O$=0.64, 0.55; $\delta^{18}O$=3.05, 2.79; $\Delta^{17}O$=-0.962, -0.913 (all per mil).
Classification: Achondrite (acapulcoite).
Specimens: A total of 14 g is on deposit at *NAU*. Mr. D. Pitt holds the main mass.

Northwest Africa 6570 (NWA 6570)
Morocco
Found: 2010
Classification: Lunar meteorite (feldspathic breccia)
History: Found in southern Morocco in 2010 and purchased from the finder by Adam Aaronson in December 2010.
Physical characteristics: A single fine-grained, brittle stone (415 g) lacking fusion crust. The interior is dark gray with dispersed small white clasts.
Petrography: (A. Irving and S. Kuehner, *UWS*) Sparse felsic lithic clasts and mineral debris are enclosed within a dark, partly glassy and vesicular matrix. Mineral clasts include pigeonite, subcalcic augite, anorthitic plagioclase, olivine, ilmenite, kamacite and troilite.
Geochemistry: Olivine ($Fa_{29.5-29.6}$; FeO/MnO=92-120), pigeonite ($Fs_{26.9-28.5}Wo_{10.0-12.7}$, $Fs_{43.7}Wo_{5.6}$; FeO/MnO=58-70), subcalcic augite ($Fs_{31.6}Wo_{29.6}$; FeO/MnO=61), plagioclase ($An_{91.5-95.4}Or_{0.4-0.3}$).
Classification: Achondrite (lunar, feldspathic breccia). This specimen is texturally and mineralogically identical to NWA 4936, NWA 5406, NWA 6221, NWA 6355 and NWA 6470 found in the same area, and evidently is paired with those stones.
Specimens: A total of 20.0 g of sample is on deposit at *UWS*. The main mass is held by *Aaronson*.

Northwest Africa 6578 (NWA 6578)
Morocco
Found: 2010
Classification: Lunar meteorite (feldspathic breccia)
History: A tan to gray 1638 g stone was purchased in Morocco by Adam Aaronson in 2010.
Physical characteristics: Surface is deeply etched in some places from desert wind abrasion, and the gray colored areas show remnant, translucent fusion crust.
Petrography: (T. Bunch and J. Wittke, *NAU*; A. Irving and S. Kuehner, *UWS*): A fine-grained (<0.5 mm, mean grain size=0.125 mm) partially annealed ultracataclastite (crushed matrix occupies > 90 vol%). The rock is an anorthosite based on the mineral modes of (vol%): anorthite 90, pigeonite 6, olivine 2, metal and FeS 2. Numerous fine-grained (<0.02 mm) micrographic-textured patches contain pigeonite + olivine + plagioclase±FeS and are roughly flow-oriented. In addition, glassy shock melt veins are subparallel to the apparent flow direction. A few elongated clusters of vermiform taenite (<0.05 mm) are interspersed with micrographic intergrowths.
Geochemistry: Plagioclase, $An_{94-96.3}$; pigeonite, $Fs_{27.7-33.4}Wo_{12.4-14}$, (FeO/MnO=73-98); olivine, $Fa_{21.7-44}$ (FeO/MnO=78-90); taenite Ni=9.8-16.7 wt. %. Shock melt glass (avg. of 3 in wt%)is SiO_2=45.2, Al_2O_3=28.8, CaO=18.9, FeO=3.86, MgO=2.12, Na_2O=0.4, TiO_2=0.47, MnO=0.18.
Classification: Achondrite (lunar, granulitic anorthositic breccia). This meteorite is one of the most feldspar-rich lunar specimens (rivaling some Apollo samples), but is texturally unique.
Specimens: A total of 20.2 g is on deposit at *NAU*. Mr. Adam *Aaronson* holds the main mass.

Northwest Africa 6579 (NWA 6579)
(Northwest Africa)
Purchased: July, 2005
Classification: Ordinary chondrite (L, melt rock)
History: A portion of the sample was donated to *Cascadia* on August 15, 2005.
Physical characteristics: The rock lacks fusion crust and has a reddish-brown weathered exterior that contains metallic protrusions and parallel elongate vesicles up to 5 mm long.
Petrography: (A.Ruzicka and K. Hauver, *Cascadia*) The sample consists primarily of fine-grained (~25 µm across) euhedral-subhedral olivine set in glass; cellular- and dendritic-textured metal-sulfide nodules partly line vesicles.
Geochemistry: Olivine $Fa_{22.4±0.8}$ (n=24); martensite Ni 12.0±3.0 wt% and Co 0.58±0.03 wt% (n=30).
Classification: Ordinary chondrite (L) melt rock. Olivine composition is in the range for L chondrites and martensite composition is similar to the bulk composition of metal in L chondrites. Silicate and metal-sulfide textures suggest rapid cooling from a melt.
Specimens: Type specimens available at *Cascadia* include 4 pieces originally totaling 21.1 g, with one polished thin section and one polished butt made from one piece. *Reed* holds the main mass.

Northwest Africa 6580 (NWA 6580)
(Northwest Africa)
Purchased: October 2005
Classification: Ordinary chondrite (L, melt breccia)
History: A portion of the sample was donated to *Cascadia* on December 13, 2005
Physical characteristics: Single stone largely covered by a brown-black fusion crust showing prominent shrinkage cracks.
Petrography: (A.Ruzicka and K. Hauver, *Cascadia*) The main lithology is nearly devoid of opaque minerals and consists largely of fine-grained (~50-100 µm) euhedral to subhedral olivine set in glass; this lithology is in sharp contact with a small area (~9 mm) at the edge of the stone that shows chondritic texture.
Geochemistry: Mineral compositions and geochemistry: Fine-grained portion has olivine $Fa_{18.8±6.9}$ (n=11); chondritic portion has olivine $Fa_{22.8±3.4}$, median 24.1 (n=24); kamacite Ni 4.78±1.55 wt% and Co 0.89±0.14 wt% (n=19); martensite Ni 13.4±4.3 wt% and Co 0.64±0.13 wt% (n=12).
Classification: Ordinary chondrite melt-breccia. Olivine Fa and kamacite Co contents from the chondritic portion are similar to L chondrites, and martensite composition is similar to the bulk composition of metal in L chondrites.
Specimens: Type specimens available at *Cascadia* include 1 piece originally 20.0 g, from which one polished thin section and one polished butt were made. *Thompson* holds the main mass.

Northwest Africa 6588 (NWA 6588)
Northwest Africa
Purchased: 2008
Classification: Ordinary chondrite (LL6, anomalous)
History: Purchased in Erfoud, Morocco, May 2008, by Adam Aaronson.
Physical characteristics: Freshly broken surface is dark gray, polycrystalline. Resembles a fine-grained peridotite. Moderately weathered, some iron oxide staining.
Petrography: (C. Agee, *UNM*) Thin section reveals ~65% olivine, 25% low-Ca pyroxene, 5% albitic feldspar, 3% sulfides, 1% chromite, <1% Fe-oxide, <1% phosphate. Silicate grain size is variable (5-300 µm) and indistinct chondrules present. Albitic feldspar grains to 150 µm. Finely disseminated Ni-rich iron sulfides (<1 µm) found throughout, and as larger pockets (>100 µm) in grain boundary contact with each other, often occupying silicate triple junctions. Sulfides show fine lamellae. Fe-Ni metal is rare. Minor amount of low-Ni, Fe-oxides present and these are presumably products of weathering, which has replaced primary metal. A few large (>200 µm) irregularly shaped Ca-phosphates with inclusions and intergrowths.

Geochemistry: (C. Agee and M. Splide, *UNM*). Olivine $Fa_{33.3\pm0.2}$, Fe/Mn=68±3, N=13; orthopyroxene $Fs_{27.0\pm0.2}Wo_{2.2\pm0.1}$, Fe/Mn=40±2, N=8; plagioclase $Or_{6.6}Ab_{84.1}An_{9.3}$, N=4; chromite Fe#=0.90, Cr#=0.87; phosphate composition consistent with whitlockite group, Fe#=0.27, Na_2O=2.4 wt%.
Classification: Ordinary Chondrite (LL6) with anomalous characteristics. Highly equilibrated, oxidized, ordinary chondrite with uniform olivine, pyroxene, and plagioclase compositions. Fayalite, ferrosilite content and Fe/Mn of olivines are high. Fa and Fs are among the highest ever reported for ordinary chondrites. Chromite/olivine geothermometer (Wlotzka, 2005) gives metamorphic equilibration temperature of 741°C, which is about 50°C above the average for LL6.
Specimens: *Aaronson* holds the main mass, 20 g on deposit at *UNM*.

Northwest Africa 6589 (NWA 6589)
(Northwest Africa)
Purchased: 2002
Classification: HED achondrite (Eucrite)
History: Purchased by Bruno *Fectay* and Carine Bidaut in Rissani, Morocco, 2002. Institute of Meteoritics (*UNM*) acquired the unclassified sample in 2011.
Physical characteristics: Single, 286 g, fusion-crusted stone. Numerous centimeter-sized regmaglypts. Interior is light gray and fine grained, with thin black melt-veins.
Petrography: (C. Agee, *UNM*) Consists of low-Ca pyroxene, high-Ca pyroxene (total pyroxene ~60%) and plagioclase feldspar (35%), with ubiquitous Cr-spinel, ilmenite, and troilite, no Fe-Ni metal or olivine. Pyroxene shows exsolution lamellae. Plagioclase occurs both as equant grains and laths. Two textural domains dominated by coarser (20 to 100 μm) and finer (5 to 20 μm) pyroxene and plagioclase. Contact between domains is sharp; brecciation absent. Several crosscutting (50 to 100 μm) silicate melt veins.
Geochemistry: (C. Agee and M. Spilde, *UNM*) EMPA. This is an equilibrated eucrite. Low-Ca pyroxene $Fs_{64.0\pm0.9}$ $Wo_{3.2\pm1.1}$ Fe/Mn=31±1 N=8, clinopyroxene $Fs_{29.4\pm2.0}$ $Wo_{43.7\pm2.2}$ Fe/Mn=33±2 N=5, plagioclase $Or_{0.6}Ab_{11.0}An_{88.4}$, silicate melt veins SiO_2=47.4±1.9 wt%, CaO/Al_2O_3 (wt%)=0.81, Mg#=0.36±0.01, TiO_2=0.71±0.05 wt%, consistent with the Nuevo Laredo trend.
Classification: Achondrite (Eucrite); minimal weathering, low shock grade, but melt veins present.
Specimens: *UNM* holds the main mass.

Northwest Africa 6592 (NWA 6592)
(Northwest Africa)
Purchased: May 2007
Classification: Primitive achondrite (Lodranite)
History: A single stone was bought in May 2007 from a nomad who had found it in the Hamada du Guir area across the Moroccan-Algerian border.
Physical characteristics: A single 15.9 g oriented stone covered with fresh fusion crust showing flow lines.
Petrography: (J. Gattacceca, *CEREGE*): Coarse-grained (1 to 2 mm) mineral aggregate with triple junctions. Modal abundances: olivine 63.6%, orthopyroxene 14.0%, kamacite 11.2%, clinopyroxene 5.6%, feldspar 3.6%, chromite 1.4%, Ca phosphate 0.4%, troilite 0.2%. Magnetic susceptibility log χ=5.70 (χ in 10^{-9} m^3/kg).
Geochemistry: (J. Gattacceca, *CEREGE*) Olivine $Fa_{13.9}$. Orthopyroxene $Fs_{13.1}Wo_{2.9}$. Clinopyroxene $Fs_{7.2}Wo_{36.6}$ containing 1.3% Cr_2O_3. Chromite Cr/(Cr+Al)=0.85. Oxygen isotopes of a 1.5 mg olivine sample (C. Suavet, C. Sonzogni, *CEREGE*): $\delta^{17}O$=1.04 ‰, $\delta^{18}O$=3.98 ‰, and $\Delta^{17}O$=-1.03 ‰.
Classification: Achondrite (lodranite). Minimal weathering.
Specimens: *CEREGE* holds 3.2 g distributed between a slice and a polished section. P. Thomas holds the main mass.

Northwest Africa 6593 (NWA 6593)
Morocco
Purchased: May 2010
Classification: Ordinary chondrite (L3)
Geochemistry: $Fa_{12.5\pm8.5}$ (range 1.0-26.8, n=14, PMD=60.8); $Fs_{7.8\pm5.5}$ (range 0.7-17.9, n=6, PMD=57.0); Cr_2O_3 in ferroan olivine is 0.16±0.07 wt%; mean chondrule diameter 678 μm; presence of dusty olivine. Estimated subtype 3.2-3.4.

Northwest Africa 6594 (NWA 6594)
(Northwest Africa)
Purchased: October 2010
Classification: HED achondrite (Eucrite)
History: Purchased by Ke Zuokai from a meteorite dealer in Ouarzazatte. The stone is partially covered with fresh fusion crust.
Petrography: Stone shows an ophitic to subophitic texture, consisting of pigeonite (46 vol%) and plagioclase (48 vol%) with minor silica (6 vol%) and opaque minerals (~1 vol%). Pigeonite ($En_{34-35}Fs_{57-63}Wo_{3-9}$) has exsolved lamellae of augite ($En_{28-30}Fs_{31-38}Wo_{33-40}$). Plagioclase is anorthitic (An_{88-90}). Opaque minerals include chromite, ilmenite, iron sulfide, metal, and zircon.

Northwest Africa 6600 (NWA 6600)
Morocco
Found: 2010
Classification: Ureilite
History: A single mass was found just south of Erfoud, Morocco, in December 2010.
Physical characteristics: Dark, coarsely granular surface. Interior shows a mosaic of green and brown olivine and pyroxene with grain sizes 1-3 mm; grain boundaries do not take a polish; some iron staining present.
Petrography: (C. Agee, *UNM*) Thin section shows approx. 75% olivine and 20% pigeonite, with numerous Fe-Ni-metal veins occupying grain boundaries and crosscutting silicates. Many of the veins have been oxidized. The metal veins are commonly haloed by tiny metal blebs grading into adjacent olivine crystals. The primary population of olivine and pigeonite crystals are 1-3 mm, with few inclusions, while smaller olivine grains 50-200 μm are often riddled with metal blebs and opaque intergrowths. Graphite may be present at grain boundaries. A single, small, Cr-rich sulfide was observed.
Geochemistry: (C. Agee and M. Spilde, *UNM*) EMPA. Olivine cores $Fa_{21.0\pm0.7}$, Fe/Mn=45±4, Cr_2O_3=0.71±0.01 wt%, n=6, small olivines at grain boundaries near metal blebs and possible graphite $Fa_{8.7\pm1.2}$, Fe/Mn=16±2 Cr_2O_3=0.76±0.04 wt%, n=2, pigeonite (cores and rims) $Fs_{18.1\pm0.2}Wo_{8.6\pm0.1}$, Fe/Mn=27±1, Cr_2O_3=1.15±0.02 wt%, n=7, metal (wt%) Fe=95.30±0.50, Ni=4.04±0.38, Co=0.37±0.05, n=4, Cr-rich Fe-sulfide (wt%) Fe=49.15, Cr=9.99, S=37.99.
Classification: achondrite (ureilite)
Specimens: *Thompson* holds the main mass, type specimen of 25.2 g total, 1.1 g fragment cast in epoxy for microprobe analysis, on deposit at *UNM*.

Northwest Africa 6601 (NWA 6601)
Morocco
Found: October 2010
Classification: HED achondrite (Eucrite)
History: Found near Mhamid, Morocco, in October 2010. Purchased in Tucson, AZ, in January 2011 by *Thompson*.
Physical characteristics: Three fragments that fit together into one mass of 276.2 g. Light-gray exterior with minor iron staining. Interior shows light-gray matrix crosscut by numerous dark-gray veins to 3 mm. Metal grains visible.

Petrography: (C. Agee, *UNM*). Thin sections reveals low- and high-Ca pyroxene (~60%) and plagioclase feldspar (30%), with silica, Cr-spinel, ilmenite, troilite, and Fe-metal; olivine absent. Pyroxene and plagioclase to 500 µm. Some areas resemble fine-grained cataclastite. Pyroxene shows exsolution lamellae and planar parting, fracturing, and microfaulting. Some plagioclase as large laths, some transitioning into impact melt. Equant to irregular Fe-metal grains to 300 µm. Troilite commonly fine grained. Numerous impact melt veins and pockets to 500 µm, containing abundant silica, troilite and rafted basaltic clasts.
Geochemistry: (C. Agee and M. Spilde, *UNM*) Equilibrated, brecciated, main group eucrite permeated with shock melt. Orthopyroxene $Fs_{61.2\pm0.9}Wo_{3.7\pm1.0}$, Fe/Mn=29±1, n=7, clinopyroxene $Fs_{26.6\pm1.0}Wo_{44.5\pm0.8}$, Fe/Mn=30±2, n=4, plagioclase $Or_{0.5}Ab_{10.1}An_{89.4}$, shock melt veins SiO_2=48.2±1.6 wt%, CaO/Al_2O_3 (wt%)=0.64, Mg#=0.37±0.01, TiO_2=0.61±0.37 wt%, n=7. Metal Ni<0.01 wt% Co=0.04±0.02 wt%, n=5.
Classification: Achondrite (eucrite); low weathering grade, high shock grade, numerous impact melt veins and pools present.
Specimens: *Thompson* holds the main mass, type specimen of 22 g on deposit at *UNM*.

Northwest Africa 6693 (NWA 6693)
Morocco
Found: March 2010
Classification: Ungrouped achondrite
Petrography: The largest pyroxene is poikilitic, 5 mm across, with mainly plagioclase chadacrysts, but pyroxenes with blocky shapes and 1-2 mm maximum dimensions are more common. Olivines are blocky, to 1 mm. Plagioclase is consistently fine-grained and anhedral (interstitial). No chondrules visible. Mineral abundances (vol%) are 70.3 pyroxene, 15.6 olivine, 13.4 plagioclase, 0.6 Cr-spinel, 0.4 Ni-rich metal, ~0.002 Ni-rich sulfide, and trace merrillite.
Geochemistry: The silicate compositions cluster tightly near: low-Ca pyx, $En_{57}Wo_{3.3}$ with FeO/MnO=90 (not HED, not martian); feldspar, $Ab_{92}Or_{2.5}$; olivine $Fo_{47\text{-}51.}$ The pyroxene in places contains small lamellae, only rarely (where blebby) large enough for EPMA, of $En_{40}Wo_{40}$ high-Ca pyroxene. Cr-spinel composition is 57.8 wt% Cr_2O_3, 32.0 wt% FeO, ~2.1 wt% Fe_2O_3, 2.8 wt% TiO_2, 1.7 wt% MgO. The Ni-rich metal is tightly clustered at 81 wt% Ni. O isotopic composition (B-G. Choi and I. Ahn, using CO_2 laser-fluorination at *Seoul-NU*; avg. of 2 similar replicate analyses): $\delta^{18}O$=4.32‰, $\delta^{17}O$=1.19‰ and $\Delta^{17}O$=-1.08‰ (per mil).
Classification: Ungrouped achondrite. No other achondrite has such ferroan mafic silicates (mg~59 low-Ca pyroxene, Fo~50 olivine) in such high modal abundance. The extremely sodic plagioclase (Ab_{92}) and Ni-rich (81 wt%) metal are also distinctive.
Specimens: A 28.4 g type specimen is on deposit at *UCLA*.

Northwest Africa 6694 (NWA 6694)
Morocco
Found: 2009
Classification: HED achondrite (Eucrite, polymict)
Petrography: Contains conspicuous dark, angular, fine-grained clasts up to 3 cm across. Its constituent grains within both the groundmass and the dark clasts are finely granulated. In the groundmass, outlines of former relatively coarse crystals are typically still discernible.
Geochemistry: Low-Ca pyroxenes FeO/MnO=29, n=8. Plagioclase $An_{87\text{-}92}$, n=8. Within the groundmass, the low-Ca pyroxenes mostly have Mg clustered at 50-51 mol% (5 of 6 analyses; the other has Mg of 44 mol%), but in one of the large dark clasts the low-Ca pyroxenes (2 analyses) have Mg of 57-58 mol%.
Classification: Achondrite (polymict eucrite).

Northwest Africa 6695 (NWA 6695)
Morocco
Found: January 2011
Classification: HED achondrite (Howardite)
Petrography: Wide variety of sizes, shapes and textures among the many clasts. Low-Ca pyroxenes have average FeO/MnO=29 (25 analyses). Plagioclase, $An_{86\text{-}95.6}$ (n=8). Many of the pyroxenes are diogenitic, with Wo in the range 2.0-2.7 mol% and Mg ranging from 65 to 77 mol%. Other, eucritic low-Ca pyroxenes cluster near Wo_2 and Mg=36 mol%. High-Ca pyroxene compositions scatter from $En_{44}Wo_{44}$ to $En_{29}Wo_{42.}$
Classification: Achondrite (howardite polymict breccia).

Northwest Africa 6696 (NWA 6696)
Morocco
Purchased: 2007
Classification: Ordinary chondrite (LL3.6)
Classification: Ordinary chondrite, LL3.6. The olivine Fa distribution ($Fa_{24.4\pm9.1}$) and low-Ca pyx Fs distribution ($Fs_{12.3\pm7.1}$) are appreciably more heterogeneous than those of Dhajala (type 3.8), indicating a subtype <3.8. The meteorite contains abundant low-Ca clinopyroxene with polysynthetic twinning (indicating type <4) and moderately abundant fine-grained matrix material (most consistent with type 3.0-3.6). Clear chondrule glass is most abundant in type 3.0-3.5; this meteorite lacks clear chondrule glass, implying a subtype >3.5. Hence, 3.6 seems the most likely subtype.

Northwest Africa 6697 (NWA 6697)
Mauritania
Purchased: 2010
Classification: Carbonaceous chondrite (C2, ungrouped)
Petrography: Aqueously altered, ~35 vol% phyllosilicate-rich matrix. Chondrules lack glassy mesostasis. Opaques in the matrix are mainly iron-sulfide and magnetite. Many chondrules are surrounded by ~50 µm phyllosilicate-rich rims. Sparse metallic Fe-Ni in chondrules; metal grains are small and surrounded by sulfide and/or magnetite. Lacks coarse metal grains in chondrules and matrix. Chondrules ~800 µm (compared to 270 µm for CM chondrites). Many chondrules have irregular convoluted boundaries and abundant chondrule fragments in the matrix. Most chondrules are type-I PO and POP and a few BO. AOIs range in size from ~500 to ~1500 µm; they constitute ~2 vol.% of the rock.
Geochemistry: Oxygen isotopes (Byeon-Gak Choi, *Seoul-NU*): Replicate analyses of acid-washed whole rock samples by laser fluorination gave $\delta^{18}O$=2.653, 2.475; $\delta^{17}O$=-2.525, -2.358; $\Delta^{17}O$=-3.923, -3.633 (all per mil).
Classification: Carbonaceous chondrite, ungrouped, petrologic grade 2. The whole-rock O-isotopic composition is on the CCAM line, indicating that the rock is not closely related to CR chondrites.

Northwest Africa 6698 (NWA 6698)
Morocco
Found: 2009
Classification: Ungrouped achondrite
History: A 38.4 g stone found October 2009 was purchased from a dealer in Erfoud, Morocco, in 2010.
Physical characteristics: No fusion crust. Surface is lightly weathered, but heavily desert wind-ablated.
Petrography: (T. Bunch and J. Wittke, *NAU*; A. Irving, *UWS*): Fine- to medium-grained (<2 mm) dioritic rock that contains 69 vol. % plagioclase, 27 vol. %, pyroxenes (augite and pigeonite), and 4 vol. % accessory phases (taenite, chromite, chlorapatite and FeS). Plagioclase displays simple albite and Carlsbad twinning, is mostly equigranular, and contains included pyroxene chadacrysts. Pyroxenes are dominantly augite and unexsolved pigeonite with highly variable grain size, and

contain included plagioclase chadacrysts. Sparse pockets of brown, glassy late-stage residuum with microlites are present between the other phases. Shock level is low to moderate, with undulatory extinction in plagioclase and some pyroxenes. Interior weathering is low.
Geochemistry: Most plagioclase shows a range in composition $An_{22.4-36}Or_{2.2}$, with a few zoned grains with cores of $An_{52-56}Or_{2.1}$ to rims of An_{36}; residuum albite, $An_{10}Or_{5.7}$. Augite, $Fs_{18.5-27.0}Wo_{36.7-41.2}$ (FeO/MnO=14-17), Al_2O_3=2.2 wt%, Na_2O=1.2 wt%; TiO_2=1.23 wt%; Cr_2O_3=1.55 wt%. Pigeonite, $Fs_{34.4-39.7}Wo_{8.6-14.5}$ (FeO/MnO=20), Al_2O_3 contents up to 3.2 wt %. Taenite Ni=15.9-49.7, chromite cr#=0.90, and FeS Ni=1.58 wt %. Residuum glass (wt %): SiO_2, 70; Al_2O_3, 13.8; Na_2O, 9.4; K_2O, 2.9; CaO 2.1; FeO, 2.8. Oxygen isotopes (D. Rumble, *CIW*): Replicate analyses of acid-washed whole rock samples by laser fluorination gave $\delta^{18}O$=4.80, 4.73; $\delta^{17}O$=3.72, 3.75; $\Delta^{17}O$ =1.199,1.265 (all per mil).
Classification: Achondrite (ungrouped). Mineralogy and mineral chemistry are unlike those of any other known achondrite, and the oxygen isotopic composition plots well above the TFL in the field for LL chondrites.
Specimens: A total of 7.7 g of material including one polished thin section are on deposit at *NAU*. Mr. A. Habibi holds the main mass.

Northwest Africa 6704 (NWA 6704)
Algeria
Purchased: 2011 January-May 2011
Classification: Ungrouped achondrite
History: A single, dense, yellowish-green stone was found in pieces in Algeria, and was purchased in February 2011 at the Tucson Gem and Mineral Show and over subsequent weeks from Moroccan dealers by Greg Hupé.
Physical characteristics: The reassembled 42 pieces (plus some granular debris) fit together as a single ovoid mass (8387 g), with rounded, shiny exterior surfaces and small patches of remnant black fusion crust. The interior is fresh, mostly pale yellowish green, with sporadic darker brownish grains and sparsely distributed tiny grains of opaque oxide and silvery metal.
Petrography: (A. Irving and S. Kuehner, *UWS*): Overall medium grained with an igneous cumulate texture. Small grains of olivine (0.5-0.8 mm) and chromite (0.1-0.6 mm) enclosed within large (to 4 mm) orthopyroxene oikocrysts, which are in turn surrounded by large optically continuous, intercumulus grains of untwinned albite and <0.1 mm awaruite. The silicates contain curvilinear trains of rounded inclusions (2-20 μm), which appear on polished surfaces to be empty bubbles with smooth rounded walls.
Geochemistry: Olivine ($Fa_{51.6-53.2}$; FeO/MnO=120-140; NiO=0.9-1.0 wt.%), orthopyroxene ($Fs_{41.6-42.4}Wo_{2.8-3.6}$, FeO/MnO=81-82; Cr_2O_3=0.3 wt.%), plagioclase ($Ab_{92-93}An_{4-3}Or_4$). Oxygen isotopes (R. Tanaka, *OkaU*): replicate analyses of acid-washed material by laser fluorination gave: $\delta^{17}O$ 1.015, 0.880; $\delta^{18}O$ 3.922, 3.613; $\Delta^{17}O$ -1.048, -1.020 per mil.
Classification: Achondrite (ungrouped). This specimen is unlike other achondrites in its combined features: relatively ferroan mafic silicates with elevated FeO/MnO ratios and anomalous Ni contents, extremely sodic plagioclase, very Ni-rich metal, and oxygen isotopic composition that plots within the field for acapulcoites-lodranites. Weathering is low and limited to minor coatings of pale orange desert dust on broken surfaces. Unshocked.
Specimens: A total of 20.5 g of type material and two polished thin sections are on deposit at *UWS*. The remaining material is held by *GHupé*.

Northwest Africa 6710 (NWA 6710)
Mali
Purchased: 2011 March
Classification: Martian meteorite (Shergottite)
History: A stone found in Mali was purchased in March 2011 by Stefan *Ralew* from a Moroccan dealer in Erfoud.
Physical characteristics: Fine grained, partly fusion crusted and partly abraded stone (74.4 g). Fresh interior is pale gray with pale tan grains, and thin, black glassy shock veins.
Petrography: (A. Irving and S. Kuehner, *UWS*) Porphyritic texture, with small (to 0.4 mm) olivine phenocrysts set in a finer grained groundmass dominated by prismatically zoned clinopyroxene and maskelynite with accessory ferroan olivine, chromite, ilmenite, titanomagnetite, merrillite, and pyrrhotite.
Geochemistry: Olivine phenocrysts (core $Fa_{27.5-31.0}$, rim $Fa_{40.6}$; FeO/MnO=51-54), pigeonite ($Fs_{30.1-34.0}Wo_{6.2-10.3}$, FeO/MnO=31-33), augite ($Fs_{25.4}Wo_{29.4}$, FeO/MnO=27), groundmass olivine ($Fa_{46.1}$, FeO/MnO=54), plagioclase ($An_{52.1-54.6}Or_{1.9-2.2}$).
Classification: Achondrite (Martian, olivine-phyric shergottite). Identical to paired stones NWA 2990, NWA 5960 and NWA 6234 in terms of grain size, texture, and mineral compositions.
Specimens: A total of 15.0 g of type material and one polished thin section are on deposit at *UWS*. The remaining material is held by *Ralew*.

Northwest Africa 6711 (NWA 6711)
(Northwest Africa)
Purchased: Sept 2009
Classification: HED achondrite (Eucrite)
History: Sample donated to *Cascadia* by Mr. Fred Olsen.
Physical characteristics: Oriented, shiny, vesicular, fusion-crusted individual with flow lines. Many grains from the interior are exposed at the surface in low spots between flow lines and along sharper edges of the specimen. Small patches of orange staining. Interior has basaltic texture. Specimen traversed by 0.3-0.5 mm wide, fine-grained, pinkish vein.
Petrography: (A. Ruzicka, *Cascadia*) Four holocrystalline lithologies. Lithology A predominates, subophitic basalt (grains ~0.2-2 mm) rich in heavily fractured pigeonite showing strong mosaic extinction, and twinned plagioclase showing undulatory extinction. Variable but not pervasive clouding by precipitates in pigeonite and plagioclase; augite occurs as lamellae in pigeonite and as discrete grains. Lithology A grades into dominantly granular areas (lithologies C, D) composed of a higher proportion of silica, augite, and ilmenite. Lithology C contains fine-grained silica, lithology D contains silica laths (to 2 mm) with undulatory extinction. The veins (Lithology B) consist of fine-grained (<0.3 mm), granular-textured basalt (relatively clear plagioclase, pigeonite, augite, ilmenite, silica mineral), which cross-cuts lithology A and occurs at the edge of lithology D.
Geochemistry: (A. Ruzicka and M. Hutson, *Cascadia*) Major minerals have relatively uniform compositions: plagioclase ($Ab_{9.6\pm1.0}An_{90.0\pm0.9}Or_{0.5\pm0.3}$, n=30), low-Ca pyroxene ($Wo_{6.2\pm0.3}En_{35.6\pm0.6}Fs_{58.3\pm0.6}$, Fe/Mn=31.7, n=21), augite ($Wo_{40.4\pm1.1}En_{29.7\pm0.5}Fs_{29.9\pm1.0}$, Fe/Mn=32.5, n=13).
Classification: Achondrite (eucrite). Equilibrated, moderately deformed, contains late-stage veining.
Specimens: A total of 20.5 g and 1 thin section are on deposit at *Cascadia*. Mr. McKenzie holds the main mass.

Northwest Africa 6712 (NWA 6712)
(Northwest Africa)
Purchased: Sept 2009
Classification: HED achondrite (Eucrite)
History: Samples were donated to *Cascadia* by Mr. Fred Olsen.
Physical characteristics: Two pieces fit together forming an overall faceted shape. Red-brown patina covers much of the surface, although a dark-grey fusion crust is visible in places, and one side shows a light-grey interior. Cut face shows a dominantly fine-grained interior, with clasts, including one large and relatively coarse basalt clast (~2-3 cm).

A discolored weathering zone extends 3-4 mm inward from one surface.
Petrography: (A.Ruzicka, *Cascadia*) Prevalent lithology consists of basalt clasts (0.7-2.4 mm) that grade into a finer grained matrix of pigeonite, plagioclase, and augite clasts (<0.3 mm). Fractured and slightly porous plagioclase largely fills interclast areas. Large, coarse basalt clast has a subophitic texture dominated by twinned plagioclase with undulose-to-mosaic extinction (up to 0.8-1.6 mm long×0.1-0.2 mm wide) and heavily fractured pigeonite with undulose-to-mosaic extinction (up to 0.6-1.5 mm); this clast is internally brecciated. Clouding by precipitates is ubiquitous in plagioclase and pyroxene but spatially variable. Throughout the section, augite occurs as lamellae in pigeonite or as discrete grains and clasts. Small calcite veins locally fill fractures.
Geochemistry: (A. Ruzicka, M. Hutson, and T.J. Schepker, *Cascadia*) Major minerals have similar compositions in the largest and smaller basalt clasts and in the clastic matrix: plagioclase ($Ab_{12\pm1.7}An_{86.7\pm1.7}Or_{1.3\pm0.8}$, n=41), pigeonite ($Wo_{8.0\pm2.4}En_{32.2\pm1.1}Fs_{59.8\pm2.1}$, Fe/Mn=32.3 wt, n=36), augite ($Wo_{40.\pm1.6}En_{28.0\pm0.9}Fs_{31.3\pm1.2}$, Fe/Mn=31.6, n=20).
Classification: Achondrite (eucrite). Equilibrated, heavily brecciated and moderately deformed, apparently monomict breccia.
Specimens: A total of 20.8 g, 1 thin section, and potted butt are on deposit at *Cascadia*. Mr. McKenzie holds the main mass.

Northwest Africa 6713 (NWA 6713)
Morocco
Found: 2010
Classification: Mesosiderite
History: Single stone bought in October 2010. The stone was found the same year, close to Beni Taijjite, Morocco.
Physical characteristics: Single 277 g fusion crusted stone.
Petrography: (J. Gattacceca, *CEREGE*): Texture is equilibrated. Silicates are orthopyroxene and plagioclase. No olivine. Large orthopyroxene crystals (to 5 mm). A large (>2 cm) orthopyroxenite clast is present. Metal and sulfides grains typically 200 μm to 1 mm. Modal abundances: silicates 80% (pyroxene 78%, plagioclase 2%), metal (kamacite and rare taenite) 10%, troilite 3%, weathering products 5%. Merrillite and chromite present. Copper grains to 80 μm associated with metal and sulfides. Weathering is moderate (~25 vol% of metal and sulfides have been oxidized). Magnetic susceptibility log χ=5.65 (χ in 10^{-9} m^3/kg).
Geochemistry: (J. Gattacceca, *CEREGE*) Orthopyroxene $Fs_{24.8\pm0.3}Wo_{2.3\pm0.4}$ (n=8). Plagioclase $An_{92.4}Ab_{1.5}Or_{0.1}$ (n=5). Kamacite Ni=5.2 wt%, taenite Ni=36.7 wt%. Chromite Cr/(Cr+Al)=0.84. The orthopyroxenite clast ($Fs_{17.2\pm0.4}Wo_{1.7\pm0.1}$) is not equilibrated with the orthopyroxenes in the bulk of the meteorite, but its oxygen isotopic composition ($\delta^{17}O$=1.82, $\delta^{18}O$=3.90, and $\Delta^{17}O$=-0.21 (all per mil), J. Gattacceca, C. Sonzogni, *CEREGE*) is within the mesosiderite range.
Classification: (J. Gattacceca, *CEREGE*) Mesosiderite (type 3C).
Specimens: A total of 25 g and one polished section are on deposit at *CEREGE*. P. Thomas holds the main mass.

Northwest Africa 6817 (NWA 6817)
Western Sahara
Found: 2011
Classification: HED achondrite (Howardite)
History: Found in Western Sahara in 2011, purchased by Jay Piatek and A. Habibi in Erfoud, Morocco, April 2011.
Physical characteristics: Total mass 1131 g. Partially covered with smooth fusion crust. Full-slice reveals many centimeter- to submillimeter-sized light-colored clasts and numerous dark clasts (<1 to3 mm) set in a light blue-gray, fine-grained matrix. One thin dark melt-vein.
Petrography: (C. Agee, *UNM*) Microprobe examination shows two populations of low-Ca pyroxene: ~75% eucritic and ~25% diogenitic. Augite present as exsolution lamellae primarily in eucritic pyroxenes. Total pyroxene volume ~50%, plagioclase feldspar ~40%. Silica phase, ilmenite, chromite, and troilite present. Olivine and Fe,Ni-metal absent. Larger clasts often coarse grained poikilitc pyroxene and plagioclase, some large clasts are poikilitc plagioclase, silica, pyroxene, and troilite, other clasts are very fine grained mosaics of pyroxene and plagioclase.
Geochemistry: (C. Agee and M. Spilde, *UNM*) Two distinct low-Ca pyroxene populations: $Fs_{60.0\ \pm4.0}Wo_{2.3\ \pm0.7}$ Fe/Mn=31±1, N=14 (eucritic), $Fs_{29.1\pm6.2}Wo_{3.0\pm1.9}$ Fe/Mn=31±2, N=7 (diogenitic), augite: $Fs_{26.0\pm1.7}Wo_{43.7\pm0.7}$ Fe/Mn=31±1, N=11, plagioclase $Or_{0.6\pm0.1}Ab_{10.8\pm0.6}An_{88.7\pm0.7}$.
Classification: Achondrite (howardite): light surface weathering, fresh cut surface has minimal weathering, moderate shock grade.
Specimens: 50 g on deposit at *UNM*, J. Piatek and *AHabibi* each hold approximately half of the main mass.

Nova 010
Location unknown
Purchased: 20 Mar 2010
Classification: H4 (reduced)
History: Purchased at a rock and mineral show - seller did not know the origin.
Classification (A. Rubin, *UCLA*): Outside the formal H-chondrite olivine range, but similar to Burnwell, Willaroy and other reduced OCs described by Wasson et al. (1993).
Reference: Wasson J.T., Rubin A.E. and Kallemeyn G.W. (1993) Reduction during metamorphism of four ordinary chondrites. Geochim. Cosmochim. Acta 57, 1867-1878.

Podolkhovsky **49°40.13´N, 42°49.95´E**
Volgograd Region, Russian Federation
Found: Oct 2007
Classification: Ordinary chondrite (L6)
History: A stone exposed on the top of soil was found by a person prospecting for antique coins using a metal detector.
Physical characteristics: The stone weighs 648 g and is partially covered by fusion crust. A piece of the stone was given to the meteorite collection of the Russian Academy of Sciences by members of the Russian Society of Meteoritical Admirers, S. A. Afanasiev, D. V. Kachalin, and Dr. A.K. Stanyukovich.
Petrography: (D. D.Badjukov, *Vernad*) Very poorly defined chondrules, olivine shows moderate mosaicism and has 2-3 systems of planar fractures, partially isotropic plagioclase.
Geochemistry: Mineral compositions: olivine ($Fa_{23.8\pm0.4}$), low-Ca pyroxene ($Fs_{19.8\pm0.4}Wo_{1.6}$), high-Ca pyroxene ($Fs_{7.3}Wo_{43.9}$), plagioclase ($Ab_{84.8}Or_{4.6}$).
Classification: Ordinary chondrite (L6), S4, W4.
Specimens: Type specimens: 134.2 g plus thin section, *Vernad*; main mass owned by the meteorite collectors.

Porto Alegre **30°01'59"S, 51°13'48"W**
Rio Grande do Sul, Brazil
Found: 2005
Classification: Iron meteorite (IIIE)
History: A single mass weighing about 200 kg was found in the city of Porto Alegre. The finder, the date and the exact location are not known, but the discovery was made prior to 2005 based on a letter from Dr. Hardy Grunewaldt, who noted the meteorite during a visit to the Museum of Catholic University of Porto Alegre. The current owner of the meteorite, Dr. Jeter Bertoletti, is the former director of the museum.
Physical characteristics: Severely weathered with no signs of the original shape and dimensions caused by mass loss from exfoliation. In samples examined at *MNRJ*, the corrosion has progressed so far that

various fragments failed to disclose any unweathered material. Corrosion penetrates to the very center, particularly along octahedral planes, which make lamellar width measurements difficult.

Petrography: (M.E.Zucolotto, *MNRJ*) Etched preserved sections display a coarse Widmanstätten structure of swollen, short kamacite lamellae with an average width of 1.6±0.3 mm. A wide zone of kamacite adjacent to taenite-plessite and phosphides are altered to oxides. The interior of some plessite fields are severely corroded showing a contrast between dark corroded alpha phase and bright preserved gamma phase. Weathering selectively attacks the nickel and phosphorous-depleted ferrite adjacent to the rhabdite precipitates that are very abundant in some kamacite lamellae. Taenite and plessite cover about 20-25% by area mostly as acicular, comb and dense martensitic fields.

Geochemistry: (J.T. Wasson, *UCLA*) Bulk composition (INAA): Ni=90.2, Co =4.96 (both mg/g); Cu=146, Ga=18.2, As=5.65, Ru=8.7, W=0.80, Ir=0.148, Pt=6.1, Au=0.898, Cr=71 (all ppm).

Classification: Iron, coarse octahedrite (IIIE), very weathered.

Specimens: A 20 g sample plus one polished thin section are on deposit at *MNRJ*. The main mass is with Dr. Jeter Bertoletti in Porto Alegre.

Red Dry Lake 067 (RdDL 067) **35°39.521'N, 114°1.544'W**
Mohave, AZ, USA
Found: 3 March 2009
Classification: Ordinary chondrite (L3.4)

History: A single, black, fusion-crusted stone was found by Paul Desilets on March3, 2009, on Red Dry Lake, Arizona.

Physical characteristics: The 6.2 g displays dull, moderately weathered black fusion crust. Several large chondrules protrude from the stone. The interior of the stone is gray with minor iron-oxide staining.

Petrography: (Laurence Garvie, *ASU*) The section shows a close-packed aggregate of chondrules and chondrule fragments to 2.2 mm. The matrix is dark with minor metal and troilite, which is sometimes concentrated at chondrule rims. Chondrules are dominated by granular, PO, POP, poikilitic pyroxene, and PP, with subordinate amounts of RP and BO. In addition, the section contains two 500 μm well-developed, purple (in PP transmitted light) glass chondrules, several chondrules with bleached rims, and a 500 μm metal-sulfide chondrule.

Geochemistry: (Laurence Garvie, *ASU*) Microprobe analyses show olivine and pyroxene of variable compositions. Olivines $Fa_{0.3\text{-}42.1}$, with a mean of 23.9 mol% (n=33). Cr_2O_3 shows a bimodal distribution with maxima at 0.02 and 0.08 wt%. Pyroxene $Fs_{1.3\text{-}31.4}$ and $Wo_{0.2\text{-}5.0.}$ One PP chondrule contains small augite grains $Fs_{20.95}Wo_{30.05.}$ Oxygen isotopes: (R. Tanaka and D. Rumble, Okayama University at Misasa), (mean of two replicates: $\delta^{17}O$=3.77‰; $\delta^{18}O$=5.48‰; $\Delta^{17}O$=0.88‰).

Classification: Ordinary chondrite, L3.4

Specimens: *ASU* holds 2.281 g (in three pieces), two thin sections and one polished stub.

Romashki **50°17.12'N, 46°41.98'E**
Volgograd region, Russia
Found: 3 Oct 2009
Classification: Ordinary chondrite (L6)

History: A single stone was found by shepherd A.G. Satkanov close to the Romashki and Prigarino villages of the Pallasovsky district in the Volgograd region. The stone was partly exposed on the surface of a field. The sample was transferred to N.F. Kharitonov, the finder of the Pallasovka meteorite, who identified the stone as a meteorite. According to Kharitonov's story, he observed a large fireball that was accompanied by a bright light and sounds over the Romashki-Prigarino area in 1971. Thus, he proposed that the stone could be related to that fireball.

Physical characteristics: One incomplete individual weighing 3400 g and 16x16x12 cm in size. It has a brown fusion crust, which is slightly oxidized. One side of the stone is chipped; the missing part was not found (15% or less in volume).

Petrography: (M. A. Ivanova, *Vernad*): The meteorite contains olivine, pyroxene, FeNi-metal, sulfides, chromites. Chondrules and their fragments are abundant (~80 vol%). The chondrules range in size from 0.2 to 0.6 mm, 0.3 mm on average. The chondrule margins are not clear and the meteorite contains different textural types of chondrules including BO, POP, and PP.

Geochemistry: Mineral compositions and geochemistry: (Borisovsky S., *IGEM*): Olivine is $Fa_{24.7}$, and low-Ca pyroxene is $Fs_{20.8}Wo_{1.62.}$

Classification: The meteorite is an ordinary chondrite of L group and petrological type 6, weathering grade is W1, and shock stage is S3.

Specimens: A 682 g piece and one thin section are on deposit at *Vernad*. *UHM* holds the main mass of the meteorite.

Sayh al Uhaymir 427 (SaU 427) **21° 5' 5"N, 57° 16' 34"E**
Al Wusta, Oman
Found: 2001
Classification: Carbonaceous chondrite (CV3)

Geochemistry and Mineralogy (*Bart*): $Fs_{43\text{-}12}Wo_{22\text{-}6}$, Cr_2O_3 0.28%. Kamacite Ni 3.6-4.8, Co 0.9-1.0; Taenite Ni 43.3-44.8, Co 0.3 (wt%); $\delta^{17}O$=-3.75‰, and $\delta^{18}O$=1.70‰.

Sayh al Uhaymir 493 (SaU 493) **20°32'N, 57°18'E**
Al Wusta, Oman
Found: 5 Apr 2009
Classification: Ungrouped achondrite

History: A small stone was found on desert pavement by Michael Farmer on April 5, 2009.

Physical characteristics: A fresh, partly fusion-crusted, dark stone weighing 134 g.

Petrography: (A. Irving and S. Kuehner, *UWS*): The overall texture is that of a medium-grained (mostly 100-400 μm), annealed igneous cumulate. The specimen is composed predominantly of exsolved pigeonitic pyroxene (with a distinctive clove brown color in transmitted light) and calcic plagioclase, with accessory ilmenite, Ti-chromite (commonly in lamellar intergrowths with ilmenite), silica polymorph, baddeleyite, iron sulfide and rare hematite. Olivine and metal are absent. Plagioclase is heterogeneously distributed in small patches, as well as occurring with pyroxene throughout the specimen. Pyroxene grains exhibit coarse, planar exsolution blades of augite within low-Ca pyroxene. Both types of pyroxene have oxide sum deficiencies and apparent cation excesses on a 6-oxygens per molecule basis, which are indicative of significant ferric iron (10% in the orthopyroxene and 14% in the clinopyroxene), as confirmed by Mössbauer spectrometry on whole sample powder (by T. Seda, *WWU*).

Geochemistry: Low-Ca pyroxene ($Fs_{56.3}Wo_{2.9}$, FeO/MnO=25.5, Fe_2O_3 (from stoichiometry)=3.5 wt.%), Ca-pyroxene ($Fs_{25.3}Wo_{42.3}$, FeO/MnO=27.0, Fe_2O_3 (from stoichiometry)=2.3 wt.%), plagioclase ($An_{88.2\text{-}89.7}Or_{0.7}$). Oxygen isotopes (D. Rumble, *CIW*): replicate analyses of acid-washed whole subsamples by laser fluorination gave, respectively: $\delta^{18}O$=3.41, 3.53; $\delta^{17}O$=1.54, 1.59; $\Delta^{17}O$=-0.255, -0.271 per mil. Bulk composition (M. Gellissen, XRF, *Koln*; C. Herd, ICPMS, *UAb*): analyses of powder prepared from interior material gave (in wt.%): SiO_2 48.6, Al_2O_3 12.1, FeO 18.5, MgO 6.7, CaO 10.1; (in ppm) La 1.1, Ce 2.9, Nd 2.6, Sm 1.1, Yb 1.5, Lu 0.22 Ni 2.3.

Classification: Achondrite, ungrouped. The degree of weathering is very low. Although this specimen has some similarities to cumulate eucrites and its oxygen isotopic composition is within the range for eucrites, the lack of metal coupled with the presence of significant ferric iron in the constituent minerals make it distinctive and unique.

Specimens: A total of 20.1 g of type material and two polished thin sections are on deposit at *UWS*. The main mass is held by *Farmer*.

Shawnee

Kansas, Johnson County, United States
Purchased: 2010
Classification: Iron meteorite (IAB-MG)

History: A single 8181 g mass was acquired at an estate sale in Shawnee, Kansas. The meteorite had been used for many years as a doorstop by a couple that lived in Shawnee. The owners of the meteorite originally owned farm ground in Barton County, Kansas, but lived for the better part of their lives in Shawnee. Unfortunately, the exact find location is unknown. A small end piece was sent to *ASU* and confirmed to be a meteorite.

Physical characteristics: Surface shows some fusion crust and minor weathering with broad regmaglypts.

Petrography: (Laurence Garvie, *ASU*) Etched sections show a coarse Widmanstätten structure, with stubby kamacite, bandwidth 1.3 mm. Kamacite lamellae display subboundaries and numerous µm-sized phosphide precipitates. Sub-millimeter schreibersite common within some kamacite grains and at grain boundaries. Neumann bands straight and well developed in rhabdite-free grains. Thin taenite and plessite cover several percent by area. Inclusions common - one 7×5 cm slice exhibits several (to 2 cm) irregular silicate-graphite-troilite-schreibersite regions. Silicates consist of olivine, low-Ca pyroxene, clinopyroxene, and plagioclase. Slice contains several 1-mm blocky schreibersite with cohenite rims.

Geochemistry: Bulk composition: INAA data (Activation Laboratories - Ancaster, Ontario): Co 0.46 mg/g, Ni 74 mg/g, Ga 57 µg/g, Ge 180 µg/g, Ir 2.24 µg/g, and Au 1.50 µg/g.

Classification: Iron meteorite, IAB-MG, coarse octahedrite, moderately shocked.

Specimens: Type specimens - two slices with total weight of 144.6 g.

Shişr 162 **18°34'N, 53°50'E**

Zufar, Oman
Found: 17 Feb 2006
Classification: Lunar meteorite (feldspathic breccia)

History: One stone was discovered on a gravel plateau of Miocene limestone of Middle Fars group about 40 km NNE of Shişr.

Physical characteristics: Dark brown stone of 5525 g without fusion crust. Magnetic susceptibility log χ ($\times 10^{-9}$ m^3/kg)=2.45.

Petrography: (R. Bartoschewitz, *Bart*.; P. Appel, B. Mader, *Kiel*) Breccia of dominantly anorthositic rocks and mineral fragments set in a fine-grained recrystallized matrix of anorthositic composition. Accessory minerals are Ni-rich iron, troilite, and chromite.

Geochemistry: (R. Bartoschewitz, *Bart*, P. Appel and B. Mader, *Kiel*) $Fa_{17.8\text{-}26.4}$ (mg#=73-81), FeO/MnO=68.2; $Fs_{16}Wo_{15}$ (mg#=71-78); FeO/MnO=50.4; $An_{91.7\text{-}97.5}$; metal Ni 65-125 mg/g, Co 6-10 mg/g. Bulk composition (R. Korotev, *WUSL*): FeO 3.3 wt%, Sc 5.3 ppm, Sm 0.55 ppm, Th 0.16 ppm, Ni 180 ppm.

Classification: (R. Bartoschewitz, *Bart*.; R. Korotev, *WUSL*) Lunar feldspathic impact melt breccia

Specimens: A total of 20.0 g of sample is on deposit at *Kiel*. 10 g and 2 thin sections are on deposit at *Bart*, main mass anonymous.

Stump Spring 083 (SS 083) **35°59'14.22"N, 115°50'89.82"W**

Nevada, USA
Found: 3 Mar 2010
Classification: Ordinary chondrite (LL6)

History: A 13.7 kg partially crusted stone was discovered by Count Guido Deiro while hunting for meteorites.

Petrography: Nearly completely recrystallized with only a few recognizable chondrules. Contains olivine, orthopyroxene, plagioclase, kamacite and taenite, ilmenite, chromite, merrillite and chlorapatite. The interior weathering grade is W2, shock level is S1.

Geochemistry: Olivine, $Fa_{27.8}$ (FeO/MnO=62); orthopyroxene, $Fs_{23.6}Wo_{1.8}$: plagioclase, $An_{12.2}Or_{2.8}$; kamacite Ni=5.8 wt % and chromite cr#=90.

Classification: Ordinary chondrite (LL6).

Specimens: A total of 20.4 g is on deposit at *NAU*. Count Deiro and Sonny *Clary* hold the main mass equally.

Watson 003 **30°29'S, 131°33'E**

South Australia, Australia
Found: 26 Aug 2008
Classification: Ordinary chondrite (H4)

History: J. Salisbury found a single mass, 200 m from Watson 004 on the Nullarbor Plain.

Physical characteristics: This small meteorite weighs 2.6 g and measures 1.7 cm x 1.5 cm x 0.6 cm. The exterior surface is a rusty brown color flecked with darker portions of fusion crust. Small chondrules are visible within the interior of this specimen.

Petrography: (Kim Lai N. Bell, *Monash*). Mineralogy consists of olivine, pyroxene, plagioclase, troilite, Fe-Ni metals and contains easily defined chondrules in a microcrystalline matrix. Chondrules lack glass and average 0.5 mm in diameter, with a range of 0.1 mm to 2 mm. Textural types include, RP BO, PP, POP and GOP. Olivine and pyroxene grains have weak undulose extinctions and irregular fracturing. Troilite (8%) and Fe-Ni metal (5%) have mostly been altered to oxides, with 77% of all sulfides and metals replaced.

Geochemistry: EMPA (wt%) Olivine: SiO_2=37.82, TiO_2=0.05, Al_2O_3=0.01, FeO=20.28, MnO=0.47, MgO=41.41, CaO=0.03, Na_2O=0.01, K_2O=0.02, ($Fa_{21.57\pm2.72}$, n=6). Low-Ca pyroxene: SiO_2=55.31, TiO_2=0.14, Al_2O_3=0.14, FeO=12.24, MnO=0.50, MgO=30.79, CaO=0.69, Na_2O=0.02, K_2O=0.03, ($Fs_{18.16\pm3.11}$, n=3). Kamacite: Ni=6.27, Co=0.35.

Classification: Ordinary Chondrite (H4) (S3) (W3).

Specimens: Sample and one thin section are retained at *Monash*.

Watson 004 **30°29'S, 131°33'E**

South Australia, Australia
Found: 26 Aug 2008
Classification: Ordinary chondrite (H4)

History: A small piece was found by A. Tomkins, 200 m from Watson 003.

Physical characteristics: The meteorite weighs 1.3 g and has a diameter of ~1.4 cm. The exterior is rusty brown, with small patches of a darker fusion crust. The chondritic texture is best observed on a freshly cut surface.

Petrography: (Kim Lai N. Bell, *Monash*). This sample is composed of easily defined chondrules in a highly rusted matrix. Chondrules range in size from 0.1 to 2 mm with an average size of 0.5 mm. The chondrules are glass-free and include textural types RP, GOP, BO, PO and POP. Olivine and pyroxene grains have a straight to weakly undulose extinction with irregular fracturing. Troilite (7%) and Fe-Ni metals (4%), kamacite and taenite, have mostly been replaced (~71%) by oxides.

Geochemistry: EMPA (wt%) Olivine: SiO_2=38.74, TiO_2=0.02, Al_2O_3=0.03, FeO=18.15, MnO=0.48, MgO=42.86, CaO=0.03, Na_2O=0.01, K_2O=0.01, (Fa=19.22 mol%, σ=1.17, n=9). Low-Ca pyroxene: SiO_2=55.59, TiO_2=0.19, Al_2O_3=0.38, FeO=11.37, MnO=0.48, MgO=31.26, CaO=0.73, Na_2O=0.03, K_2O=0.00, (Fs=16.77 mol%).

Classification: Ordinary Chondrite (H4, S2, W3).

Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

Watson 005 **30°30'S, 131°42'E**

South Australia, Australia

Found: 9 May 2009
Classification: Ordinary chondrite (H5)

History: A solitary piece found by A. Langendam on the stony surface of the Nullarbor Plain.

Physical characteristics: This meteorite is dark maroon in color, weighs 1.6 g and measures 1.7 cm on the longest axis. Small chondrules and metallic grains are best observed on a fresh surface.

Petrography: (Kim Lai N. Bell, *Monash*). Readily discernible chondrules lie in a heavily stained matrix, which makes it difficult to gauge the amount of recrystallization in the matrix. Chondrules are devoid of glass and range from 0.25-1 mm in size with an average of 0.3 mm. Textural types include RP, POP, BO and PO with some of the latter rimmed by olivine. Mineralogy consists of olivine, pyroxenes, feldspar, Fe-Ni metal and sulfides. Olivine and pyroxene grains have a straight to undulose extinction with planar fracturing evident in larger grains. Twinned plagioclase occurs as an accessory mineral and is generally <50 μm in size. Metal phases (5%) include kamacite and taenite, which can occur as small irregular shaped grains. Troilite (7%) also occurs in a similar fashion to the metallic phases. Both metal and sulfide minerals have been oxidized, with up to 28% of these minerals being replaced by oxides.

Geochemistry: EMPA (wt%) Olivine: SiO_2=38.81, TiO_2=0.02, Al_2O_3=0.01, FeO=17.96, MnO=0.45, MgO=42.45, CaO=0.03, Na_2O=0.01, K_2O=0.00, (Fa=19.19 mol%, σ=0.34, n=8). Low-Ca pyroxene: SiO_2=55.62, TiO_2=0.06, Al_2O_3=0.14, FeO=12.43, MnO=0.46, MgO=30.79, CaO =0.39, Na_2O=0.02, K_2O=0.00, (Fs=18.43 mol%, σ=2.27, n=4). Feldspar: SiO_2=64.97, TiO_2=0.01, Al_2O_3=18.45, FeO=1.20, MnO=0.00, MgO=0.00, CaO=0.00, Na_2O=0.71, K_2O=16.38, (Or=93.12 mol%).

Classification: Ordinary Chondrite (H5, S2, W2).

Specimens: Single sample and one thin section held by A. Tomkins at *Monash*.

Watson 006 **30°30'S, 131°42'E**

South Australia, Australia
Found: 9 May 2009
Classification: Ordinary chondrite (L5)

History: Two interlocking pieces were found by A. Tomkins.

Physical characteristics: This meteorite weighs 53.0 g. A matte black fusion crust present. Small, pale colored chondrules visible. The fresh interior is a pale grayish green with metal grains, veins and chondrules evident.

Petrography: (Kim Lai N. Bell, *Monash*). Readily discernible chondrules lie within a recrystallized matrix and include RP, POP, PP and BO. Sizes range from 0.25 to 1.5 mm, with an average diameter of 0.5 mm. Mineralogy consists of olivine, pyroxene, plagioclase, Fe-Ni metal (kamacite, taenite), and sulfides plus trace amounts of a carbon-based mineral. Olivine and pyroxene have undulose extinctions and planar fracturing in the larger grains. Plagioclase grains occur as small grains, <50 μm in size and have undulose extinctions. Metals (5%) and sulfides (5%) occur as irregularly shaped grains within the matrix, chondrules, melt veins and as small blebs in the 2-3 mm wide ablation surface. One semi-continuous metal vein cuts across the meteorite and is up to 1.5 mm wide, containing 2 large, mm-sized spherical blebs of troilite plus several micrometer-sized grains of a hard carbon polymorph. Up to ~3% of the metals and sulfides are replaced by oxides.

Geochemistry: EMPA (wt%) Olivine: SiO_2=37.24, TiO_2=0.05, Al_2O_3=0.01, FeO=22.62, MnO=0.50, MgO=39.44, CaO=0.02, Na_2O=0.02, K_2O=0.00, (Fa=24.34, σ=0.19, n=8). Low-Ca pyroxene: SiO_2=53.78, TiO_2=0.11, Al_2O_3=0.13, FeO=14.11, MnO=0.52, MgO=29.53, CaO=0.61, Na_2O=0.03, K_2O=0.01, (Fs=21.14, σ=0.91, n=8). Kamacite: Ni=6.68, Co= 0.81.

Classification: Ordinary chondrite (L5, S4, W1).

Specimens: Both pieces and two thin sections held by A. Tomkins at *Monash*.

Watson 007 **30°29'S, 131°41'E**

South Australia, Australia
Found: 10 May 2009
Classification: Enstatite chondrite (EL3)

History: A single piece was found on the Nullarbor Plain by A. Langendam.

Physical characteristics: The 19.5 g specimen measures 3.2 x 2.7 x 1.2 cm. Some chondrules, as well as remnant fusion crust, are observable on the maroon-colored weathered surface.

Petrography: (Kim Lai N. Bell, *Monash*). This chondritic meteorite has sharply defined chondrules within a fine-grained dark matrix. Mineralogy is dominated by orthopyroxene but also includes Fe-Ni metal, clinopyroxene, sulfides plus trace amounts of olivine. Chondrules (0.25-2 mm with an average of 0.7 mm) include RP and PP. Some glass present in the chondrules. Orthopyroxene grains have undulose extinction and irregular fracturing. Olivine is rare with the occasional small grain (<50 μm) occurring within PP chondrules. Fe-Ni metals (7%), plus sulfides (6%) occur as small irregular grains that have been heavily oxidized, with up to 97% being replaced. The chondrules are quite large with a high proportion exceeding 1 mm and the majority exceeding 0.5 mm, consistent with EL rather than EH chondrite classification and presence of manganoan daubréelite (Mg-free) also suggests EL rather than EH.

Geochemistry: EMPA (wt%) Olivine: SiO_2=41.77, TiO_2=0.00, Al_2O_3=0.03, FeO=0.13, MnO=0.02, MgO=57.90, CaO=0.02, Na_2O=0.02, K_2O=0.00, ($Fa_{0.22}$). Low-Ca pyroxene: SiO_2=58.82, TiO_2=0.01, Al_2O_3=0.19, FeO=0.37, MnO=0.01, MgO=340.69, CaO=0.28, Na_2O=0.01, K_2O=0.00 ($En_{99.92\pm0.21}$, n=14). Troilite: Cr=0.45, Ti=0.48, Ni=0.20. Daubréelite: Cr=31.61, Ti=0.13, Mn=1.89, Ni=0.07.

Classification: Enstatite chondrite (EL3, S2, W4).

Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

Watson 008 **30°30'S, 131°41'E**

South Australia, Australia
Found: 10 May 2009
Classification: Ordinary chondrite (H5)

History: Single piece found by K L. Bell on the Nullarbor Plain.

Physical characteristics: Small (1.1 x 1.2 x 0.5 cm, 1.5 g), rusty brown specimen. There are no obvious chondrules or fusion crust on the exterior. Small chondrules are evident within the rusted interior.

Petrography: (Kim Lai N. Bell, *Monash*). Specimen has a chondritic texture of chondrules lying in a dark-stained matrix. Mineralogy includes olivine, pyroxene, plagioclase, Fe-Ni metal and sulfides. Olivine and pyroxenes have a straight to undulose extinction with irregular fracturing apparent. Chondrules are readily delineated (~50%), absent of glass and have diameters ranging from 0.25-1 mm with an average of 0.3 mm. Textural types that occur are RP, PO and POP. Metallic phases (7%) include taenite and kamacite varieties. These metals, as well as troilite (4%) have been oxidized along grain boundaries, with about 40% of these phases being replaced.

Geochemistry: EMPA (wt%) Olivine: SiO_2=39.02, TiO_2=0.01, Al_2O_3=0.00, FeO=218.32, MnO=0.45, MgO=42.28, CaO=0.01, Na_2O=0.00, K_2O=0.00 (Fa=19.94 mol%, σ=0.51, n=8). Low-Ca pyroxene: SiO_2=56.64, TiO_2=0.16, Al_2O_3=0.21, FeO=11.53, MnO=0.48, MgO=30.55, CaO=0.64, Na_2O=0.05, K_2O=0.01, (Fs=17.14 mol%, σ=0.34, n=8). Plagioclase: SiO_2=68.68, TiO_2=0.05, Al_2O_3=21.99, FeO=0.48, MnO=0.00, MgO=0.02, CaO=2.54, Na_2O=19.30, K_2O=1.25 (An=12.68 mol%). Kamacite: Ni=6.18, Co=0.40.

Classification: Ordinary chondrite (H5) (S2) (W2).

Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

Watson 009 **30°30'S, 131°41'E**

South Australia, Australia
Found: 10 May 2009
Classification: Ordinary chondrite (H5)

History: K L. Bell found one piece on the Nullarbor Plain.

Physical characteristics: Small (1.4 x 1.1 x 0.5 cm), dark-brown, rusty specimen weighs 1.0 g. There is no obvious fusion crust or chondrules evident on the exterior. Small chondrules are best observed on a freshly cut surface.

Petrography: (Kim Lai N. Bell, *Monash*). Readily delineated chondrules lie within a heavily stained matrix, which makes it difficult to ascertain weather or not the matrix has been recrystallized. Chondrules range in size from 0.1-1 mm, with an average diameter of 0.5 mm and types include PO, POP, RP, BO and GOP. Mineralogy is typically chondritic and includes olivine, pyroxene, Fe-Ni metal and sulfides. Both olivine and pyroxenes have straight to undulose extinctions plus irregular fracturing. Metals (~11%), taenite and kamacite, as well as troilite (4%), occur as irregularly shaped grains that have been heavily replaced by oxides (96%).

Geochemistry: EMPA (wt%) Olivine: SiO_2=39.17, TiO_2=0.01, Al_2O_3=0.01, FeO=17.26, MnO=0.49, MgO=43.29, CaO=0.01, Na_2O=0.01, K_2O=0.00, (Fa=18.28 mol%, σ=0.09, n=6). Low-Ca pyroxene: SiO_2=56.15, TiO_2=0.13, Al_2O_3=0.33, FeO=10.96, MnO=0.52, MgO=31.01, CaO=0.69, Na_2O=0.02, K_2O=0.01, (Fs=16.27 mol%, σ=0.19, n= 7). Kamacite: Ni=6.88, Co=0.33. Troilite: Ni=0.00-0.82.

Classification: Ordinary chondrite (H5, S2, W4).

Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

Watson 010 **30°30'S, 131°43'E**

South Australia, Australia
Found: 11 May 2009
Classification: Ordinary chondrite (H5)

History: Single mass found by K L. Bell on the Nullarbor Plain.

Physical characteristics: This meteorite is a dark brown to black. The darker coloring has been attributed to areas with fusion crust still intact (~80%). Dimensions for this sample measure 2.6 cm x 2.2 cm x 1.7 cm with weight of 19.3 g.

Petrography: (Kim Lai N. Bell, *Monash*). Well-defined chondrules in a rusty brown matrix, which makes it difficult to ascertain whether or not it has been recrystallized. Chondrule types include RP, POP, BO and CC with a size range between 0.2-1 mm and an average size of 0.4 mm. Mineralogy consists of olivine, pyroxene, Fe-Ni metal and sulfides. Olivine and pyroxene have undulose extinctions and planar fracturing. Fe-Ni metals (4%), taenite and kamacite, plus troilite (7%) have been heavily oxidized with up to 98% all metal and sulfides replaced.

Geochemistry: EMPA (wt%) Olivine: SiO_2=39.50, TiO_2=0.03, Al_2O_3=0.00, FeO=17.72, MnO=0.47, MgO=42.30, CaO=0.02, Na_2O=0.00, K_2O=0.00, (Fa=19.03 mol%, σ=0.24, n=10). Low Ca-Pyroxene: SiO_2=56.73, TiO_2=0.05, Al_2O_3=0.38, FeO=11.62, MnO=0.55, MgO=30.40, CaO=0.52, Na_2O=0.05, K_2O=0.01, (Fs=17.30 mol%, σ=1.53, n=5). Kamacite: Ni =5.31, Co=0.49.

Classification: Ordinary chondrite (H5, S3, W4).

Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

Watson 011 **30°31'S, 131°30'E**

South Australia, Australia
Found: 12 May 2009
Classification: Ordinary chondrite (H4)

History: D. Bradley found a single piece lying on the Nullarbor Plain.

Physical characteristics: This sample weighs 4.1 g and measures 1.8 cm x 1.4 cm x 0.8 cm. The exterior is dark brown, rusty and ~90 % fusion crusted.

Petrography: (Kim Lai N. Bell, *Monash*). Chondrules lie within a dark rusty brown matrix. Mineralogy is composed of olivine, pyroxene, Fe-Ni metal and sulfides. Olivine and pyroxene grains have undulose extinctions with larger grains exhibiting planar fracturing. Chondrule types include, RP, POP, BO and PP. Glass is not present with chondrules just discernible and ranging in size from 0.1-1 mm, with an average of 0.5 mm. Fe-Ni metals (4%) kamacite and taenite and the sulfide troilite (8%) occur as irregular shaped grains, with up to ~83% replaced by oxides.

Geochemistry: EMPA (wt%) Olivine: SiO_2=38.89, TiO_2=0.07, Al_2O_3=0.03, FeO=18.09, MnO=0.45, MgO=42.08, CaO=0.03, Na_2O=0.01, K_2O=0.01, (Fa=19.44 mol%, σ=1.09, n=8). Low Ca-Pyroxene: SiO_2=55.86, TiO_2=0.09, Al_2O_3=0.44, FeO=11.29, MnO=0.50, MgO=30.49, CaO=0.66, Na_2O=0.04, K_2O=0.01, (Fs=16.86 mol%, σ=1.14, n=5). Kamacite: Ni=6.48, Co=0.32. Troilite: Fe=63.04, Ni=0.05.

Classification: Ordinary chondrite (H5, S3, W3).

Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

Watson 012 **30°34'S, 131°30'E**

South Australia, Australia
Found: 12 May 2009
Classification: Ordinary chondrite (H7)

History: The first piece was found by A. Tomkins during May 2009. A further 11 pieces were collected from the Nullarbor Plain in 2009 by A. Tomkins and A. Langendam. The following year, on 14 April 2010, another 9 pieces were found by A. Tomkins, using a metal detector. The total number of pieces is 21.

Physical characteristics: The total mass collected weighs 103.1 g, with the largest piece measuring 3.3 cm x 2.6 cm x 1.4 cm. The exterior is a dull brown with no obvious chondrules or fusion crust. The cut surface is a rusty brown with the occasional fleck of metal and no obvious chondrules. The 21 pieces were all found within ~25 m of each other (some buried), they are all broken pieces with the same externally weathered appearance, they have the same magnetic response, and they respond similarly to a metal detector as a function of size. We have noted that other weathered meteorites on the Nullarbor show a similar breakup and dispersal pattern, which widens as a function of weathering duration.

Petrography: (Kim Lai N. Bell, *Monash*). A fine- to coarse-grained, granular texture distinguishes this meteorite from most chondrites. Grain sizes have a heterogeneous distribution such that fine grains are associated with domains of extensively interconnected intergranular plagioclase, and coarse grains occur away from these zones. Grain size ranges from <0.1-0.7 mm, with an average of ~0.3-0.4 mm. Mineralogy is similar to an ordinary chondrite and includes olivine (45%), pyroxene (25%), plagioclase (9%), Fe-Ni metal (8%) and troilite (10%). Olivine and pyroxene dominantly display sharp extinctions, with occasional very weakly undulose extinction being observed, plus some irregular fracturing in larger grains. Plagioclase (50 μm to 1 mm) has a distinctly unusual texture, occurring in extensively interconnected interstitial domains and containing numerous spherical inclusions of olivine and pyroxene. Nine indistinct chondrules were identified in 4 separate thin sections. These chondrules include BO, PO, POP and PP, with diameters ranging from 0.5 mm to 1 mm (average ~0.8 mm). Metal and sulfides are highly oxidized with up to 90% of these minerals being replaced.

Geochemistry: EMPA (wt%) Olivine: SiO_2=38.63, TiO_2=0.00, Al_2O_3=0.00, FeO=16.04, MnO=0.49, MgO=44.90, CaO=0.02,

Na_2O=0.02, K_2O=0.01, ($Fa_{16.70\pm0.11}$, n=8). Low-Ca pyroxene: SiO_2=54.95 TiO_2=0.18, Al_2O_3=0.41, FeO=10.17, MnO=0.53, MgO=30.92, CaO=1.87, Na_2O=0.07, K_2O=0.01, ($Fs_{15.11\pm0.22}$, n=4). Plagioclase: SiO_2=65.08, TiO_2=0.05, Al_2O_3=22.32, FeO=0.90, MnO=0.01, MgO=0.03, CaO=3.21, Na_2O=8.95, K_2O=0.95 ($An_{16.18\pm2.22}$, n=7). Kamacite: Ni=6.89, Co=0.35. Troilite: Fe=62.68, Ni=0.11, Cr=0.11. Oxygen isotopes: $\delta^{17}O$=+3.44, $\delta^{18}O$=+ 5.50, $\Delta^{17}O$=0.58.
Classification: Ordinary chondrite (H7, S1/2, W3)
Specimens: All pieces and four thin sections held by A. Tomkins at *Monash*.

Willcox Playa 009 **32°4.6'N, 109°50.73'W**
Arizona, United States
Found: 2009 Sept 23
Classification: Mesosiderite
History: A whole stone was recovered by Ruben Garcia while he was hunting for meteorites on Willcox Playa. It was partly buried in the soil.
Physical characteristics: A single ~160 g stone with a smooth weathered surface and deep cracks. It has a reddish brown weathered surface. Only remnant fusion crust remains.
Petrography: Pyroxene occurs in clasts ranging in size from less than 1 mm to 5 mm surrounded by a network of weathered metal. Silica (to 1 mm) occurs in association with pyroxene. Plagioclase ranges in size from 1 to about 3 mm. Metal (mainly weathered) occurs as an extensive network that surrounds all of the clasts. Troilite (to 1 mm) is heterogeneously distributed. Tetrataenite (to 0.5 mm) is distributed throughout the sample.
Geochemistry: Silicates comprise about 70% of the thin section area, metal and sulfide 30%. The silicate phase is dominated by low-Ca pyroxene ($Fs_{21-30}Wo_{0.8-3}En_{62-78}$), average plagioclase ($An_{88}Ab_{11}Or_{0.4}$) and silica. No olivine was observed. Low-Ca pyroxene is the dominant silicate, comprising about 64% of the silicate phase and about 45% of the entire section; 25% plagioclase; 29% metal; 2% sulfide. Fe/Mn ratio of pyroxene ~27. Tetrataenite contains 34 - 48 wt% Ni. The kamacite veins are too weathered to be analyzed.
Classification: This meteorite is classified as a mesosiderite. The degree of shock is S1 with a weathering grade of W3.
Specimens: 20 g + TS (*LPL*); 100 g + 1 TS + 1 potted butt (*ASU*).

Yarle Lakes 004 **30°30'S, 131°28'E**
South Australia, Australia
Found: 11 May 2009
Classification: Carbonaceous chondrite (CK4)
History: D. Bradley found a single piece lying on the Nullarbor Plain.
Physical characteristics: The meteorite weighs 4.6 g and measures 2.2 cm x 1.6 cm x 0.7 cm. The surface is dark maroon to black and has no obvious fusion crust. The freshly cut surface reveals a dark rusted brown interior with several paler chondrules scattered throughout.
Petrography: (Kim Lai N. Bell, *Monash*) Large PO chondrules within a dark stained, fine-grained matrix and are difficult to discern due to the staining. Chondrules have a size range of 0.3-1 mm, with an average diameter of 0.6 mm. Mineralogy differs from an ordinary chondrite in that it contains no obvious metals or sulfides. Mineralogy dominated by olivine, plagioclase, pyroxenes and magnetite. Olivine and pyroxene grains have straight to undulose extinctions and occur within chondrules or as fragments in the matrix. Plagioclase tends to occur as small grains (≤50 μm) within both the matrix and chondrules. The silicates are stained a rusty brown, with up to 75% staining affecting them. Magnetite (4%) grains are irregular shaped, <0.1 mm in size and can be found rimming chondrules and within the matrix.
Geochemistry: EMPA (wt%) Olivine: SiO_2=36.85, TiO_2=0.02, Al_2O_3=0.02, FeO=28.87, MnO=0.26, MgO=34.49, CaO=0.02, Na_2O=0.01, K_2O=0.00, ($Fa_{31.95\pm0.13}$, n=6). Plagioclase: SiO_2=55.73, TiO_2=0.01, Al_2O_3=26.27, FeO=0.52, MnO=0.01, MgO=0.22, CaO=9.71, Na_2O=5.83, K_2O=0.65 ($An_{47.26\pm18.59}$, n=5). Pentlandite: Fe=27.96, Ni=30.66, Cr=1.26, Mg=0.71. Magnetite: Fe=61.25, Cr=3.27, Al=1.33, Ti=0.74, Mg=0.34, Ni=0.19.
Classification: Carbonaceous chondrite (CK4, S2, W1-4).
Specimens: Sample and one thin section held by A. Tomkins at *Monash*.

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Table 1. List of meteorites in Meteoritical Bulletin 99.

Name	Class	Country	State/Prov	Date	Lat	Long	Mass	Pieces	T.S.	T. S. Loc	Main mass
Acfer 234	Iron, IAB-ung	Algeria	Tamanghasset	1991	27°30'4"N	4°5'55"E	621	1	535	NHMV	NHMV
Acfer 391	H4	Algeria	Tamanghasset	2004	27°35.77'N	4°10.32'E	388	27	21	MSP	MSP
Ashuwairif 003	H4	Libya	Ash Shati'	2008	29°21.50'N	14°14.90'E	2900	3	22.3	MSP	OAM
Ashuwairif 004	L6	Libya	Gharyan	2008	29°21'57"	14°16'34"	15750	many	65.3	CEREGE	OAM
Biduna Blowhole 001	L4	Australia	South Australia	5 Dec 2009	31°01'S	131°19'E	103.4	17	103.4	Monash	Monash
Bluewing 037	H5	United States	Nevada	2009 Sept 9	40°16.914'N	118°56.816'W	37.2	1	10.1	UCLA	D. Waterbury
Bouanane	L6	Morocco	Eastern	2009	31°59'N	3°12'W	1395	1	22.2	CEREGE	P. Thomas
Boulder Mine	L5	United States	Arizona	2008 Nov 4	34°41.10'N	114°19.38'W	1560	1	21.33	UAz	T.L. Parker
Camp Creek	H4	United States	Arizona	27 Nov 2009	33°52.859'N	111°47.135'W	3016	1	25.59	ASU	finder
Campinorte	Iron, ungrouped	Brazil	Goias	1992	14°15.48'S	49°9.55'W	~2 tons	1	26.2	MNRJ	anonymous
Chandler	L6	United States	Arizona	24 Jan 2009	33°14.735'N	111°53.780'W	350.4	1	22.69	ASU	A. Black
Coyote Dry Lake 318	H5	United States	California	11 Apr 2009	35°4.506'N	116°45.023'W	7.2	1	1.5	UCLA	G. Stanley
Cuddeback Dry Lake 013	H4	United States	California	7 Feb 2008	35° 18.731'N	117° 27.182'W	1.6	1	0.85	UCLA	Verish
Cuddeback Dry Lake 017	H6	United States	California	5 Jan 2008	35° 17.117'N	117° 28.983'W	23.1	1	4.6	UCLA	Verish
Cuddeback Dry Lake 018	H4	United States	California	16 Jan 2008	35° 17.183'N	117° 28.983'W	8.5	1	2.1	UCLA	Verish
Cuddeback Dry Lake 019	L6	United States	California	20 Jan 2008	35° 18.273'N	117° 27.490'W	10.1	1	1.6	UCLA	Verish
Cuddeback Dry Lake 023	H5	United States	California	Oct 1986	35°19'29.28"N	117°28.79'W	123	1	123	UCLA	UCLA
Cuddeback Dry Lake 028	L5	United States	California	2008 March 22	35°17.76'N	117°28.32'W	19.5	1	6.0	UCLA	D. Waterbury
Cuddeback Dry Lake 029	H4	United States	California	2008 March 30	35°17.76'N	117°28.32'W	22.2	1	6.7	UCLA	D. Waterbury
Dar al Gani 1052	LL5	Libya	Al Jufrah	2008	27°19.70'N	16°13.12'E	280	1	21.4	MSP	OAM
Dar al Gani 1054	Ureilite	Libya	Al Jufrah	1999	27°25.66'N	16°09.93'E	28.4	1	8	MSP	OAM
Dar al Gani 1055	Eucrite-pmict	Libya	Al Jufrah	2007	27°22.80'N	16°28.14'E	305	1	60	MSP	OAM
Dar al Gani 1057	LL5	Libya	Al Jufrah	1998 Dec 27	27°16.8'N	16°08.87'E	114	1	20.0	Kiel	anonymous
Dhofar 1515	H6	Oman	Zufar	16 Nov 2008	18°31.52'N	54°37.03'E	1450	1	38	UWS	M. Farmer
Dhofar 1516	H5	Oman	Zufar	15 Nov 2008	18°24.52'N	54°35.72'E	1134	1	47	UWS	M. Farmer
Dhofar 1517	H5	Oman	Zufar	18 Nov 2008	18°55.58N	54°24.77'E	1064	1	39	UWS	M. Farmer
Dhofar 1518	H4	Oman	Zufar	21 Nov 2008	18°43.92'N	54°23.07'E	450	1	90	UWS	M. Farmer
Dhofar 1520	H4	Oman	Zufar	17 Nov 2008	18°41.07'N	54°32.38'E	1490	1	73	UWS	M. Farmer
Dhofar 1521	L6	Oman	Zufar	23 Nov 2008	18°24.10'N	54°32.83'E	1940	1	55	UWS	M. Farmer
Dhofar 1522	H6	Oman	Zufar	25 Nov 2008	18°40.28'N	54°40.90'E	625	1	36	UWS	M. Farmer
Dhofar 1524	H5	Oman	Zufar	21 Nov 2008	18°30.68'N	54°36.47'E	4652	1	80	UWS	M. Farmer
Dhofar 1525	H4	Oman	Zufar	22 Nov 2008	18°46.58'N	54°23.78'E	6476	1	168	UWS	M. Farmer
Dhofar 1530	H6	Oman	Zufar	19 Mar 2006	18°13.15'N	54°18.92'E	2118	1	28.3	UWS	M. Farmer
Dhofar 1531	L6	Oman	Zufar	21 Mar 2006	18°13.15'N	54°18.92'E	2100	1	42.3	UWS	M. Farmer
Dhofar 1532	H4	Oman	Zufar	21 Mar 2006	19°00.57'N	54°30.13'E	487	1	20.3	UWS	M. Farmer
Dhofar 1533	LL5	Oman	Zufar	25 Apr 2006	18°21.07'N	54°31.92'E	341	1	22.5	UWS	M. Farmer
Dhofar 1534	H4	Oman	Zufar	26 Apr 2006	18°11.08'N	54°35.35'E	3045	1	110	UWS	M. Farmer
Dhofar 1535	H6	Oman	Zufar	28 Apr 2006	18°30.90'N	54°06.33'E	2008	1	187	UWS	M. Farmer
Dhofar 1536	H6	Oman	Zufar	16 Nov 2006	19°13.17'N	54°55.28'E	176	1	20.7	UWS	M. Farmer
Dhofar 1537	L6	Oman	Zufar	19 Nov 2006	18°31.72'N	54°38.52'E	48	1	9.6	UWS	M. Farmer
Dhofar 1539	H4	Oman	Zufar	22 Nov 2006	18°16.00'N	54°25.50'E	1614	1	74	UWS	M. Farmer
Dhofar 1542	L6	Oman	Zufar	04 Jan 2008	18°10.45'N	54°16.88'E	500	1	23.5	UWS	M. Farmer
Dhofar 1543	H4	Oman	Zufar	04 Jan 2008	18°13.32'N	54°19.07'E	1734	1	48.7	UWS	M. Farmer
Dhofar 1544	L4	Oman	Zufar	04 Jan 2008	18°21.82'N	54°33.92'E	2808	1	123.7	UWS	M. Farmer
Dhofar 1545	H4	Oman	Zufar	05 Jan 2008	18°34.47'N	54°35.42'E	1013	1	30.4	UWS	M. Farmer
Dhofar 1546	L5	Oman	Zufar	07 Jan 2008	18°32.07'N	54°38.40'E	119	1	23.5	UWS	M. Farmer
Dhofar 1547	H4	Oman	Zufar	07 Jan 2008	18°35.10'N	54°16.80'E	380	1	39.8	UWS	M. Farmer
Dhofar 1548	L6	Oman	Zufar	08 Jan 2008	18°38.82'N	54°10.53'E	4070	1	89.4	UWS	M. Farmer
Dhofar 1550	H4	Oman	Zufar	09 Jan 2008	18°35.45'N	54°32.58'E	624	1	44.7	UWS	M. Farmer
Dhofar 1551	H6	Oman	Zufar	12 Jan 2008	18°38.00'N	54°20.85'E	451	1	74.2	UWS	M. Farmer

Dhofar 1553	H4	Oman	Zufar	07 Apr 2009	18°51.02'N	54°23.07'E	1006	1	59	UWS	M. Farmer
Dhofar 1555	H4	Oman	Zufar	07 Apr 2009	18°38.83'N	54°31.70'E	605	1	55	UWS	M. Farmer
Dhofar 1556	H4	Oman	Zufar	06 Apr 2009	18°43.73'N	54°34.63'E	1722	1	85	UWS	M. Farmer
Dhofar 1557	L6	Oman	Zufar	10 Apr 2009	18°27.63'N	54°39.48'E	432	1	50	UWS	M. Farmer
Dhofar 1567	L4	Oman	Zufar	10 Apr 2009	18°57.73'N	54°11.38'E	341	1	29	UWS	M. Farmer
Dhofar 1568	H4	Oman	Zufar	07 Apr 2009	18°53.00'N	54°41.03'E	1460	1	50	UWS	M. Farmer
Dhofar 1569	L6	Oman	Zufar	13 Jan 2005	18°38.92'N	54°25.85'E	345	1	42	UWS	M. Farmer
Dhofar 1570	H5	Oman	Zufar	18 Nov 2006	18°41.27'N	54°24.73'E	948	1	155	UWS	M. Farmer
Dhofar 1576	L5	Oman	Zufar	01 Mar 2010	18°31'N	54°14'E	7700	1	33.8	UWS	R. Ward
Dhofar 1580	LL6	Oman	Zufar	02 Dec 2004	18°34.07'N	54°25.61'E	1503	1	374.3	Vernad	anonymous
Dhofar 1581	H5	Oman	Zufar	02 Dec 2004	18°29.21'N	54°21.02'E	488	1	205.3	Vernad	anonymous
Dhofar 1582	L5	Oman	Zufar	29 Nov 2004	19°22.17'N	54°32.29'E	276	1	97	Vernad	anonymous
Dhofar 1583	H5	Oman	Zufar	09 Dec 2004	18°29.86'N	54°19.81'E	510	1	128.6	Vernad	anonymous
Dhofar 1584	H5	Oman	Zufar	09 Dec 2004	18°25.25'N	54°25.68'E	194	1	39	Vernad	anonymous
Dhofar 1585	L5	Oman	Zufar	06 Dec 2004	18°47.03'N	54°25.21'E	256	1	79.5	Vernad	anonymous
Dhofar 1586	H5	Oman	Zufar	30 Nov 2004	19°10.21'N	54°34.12'E	78	1	29.1	Vernad	anonymous
Dhofar 1587	H5	Oman	Zufar	08 Dec 2004	19°03.46'N	54°32.74'E	36	1	15.1	Vernad	anonymous
Dhofar 1588	L5	Oman	Zufar	05 Dec 2004	18°59.59'N	54°16.76'E	1224	1	51.2	Vernad	anonymous
Dhofar 1589	H5	Oman	Zufar	03 Dec 2004	18°40.36'N	54°25.75'E	360	4	67.5	Vernad	anonymous
Dhofar 1590	H5	Oman	Zufar	04 Dec 2004	18°57.10'N	54°16.87'E	996	5	74.6	Vernad.	anonymous
Dhofar 1591	H5	Oman	Zufar	14 Mar 2005	18°45.86'N	54°23.22'E	556	1	63.6	Vernad	anonymous
Dhofar 1592	H5	Oman	Zufar	05 Dec 2004	18°55.08'N	54°21.23'E	274	1	88.5	Vernad	anonymous
Dhofar 1593	H5	Oman	Zufar	06 Dec 2004	18°56.15'N	54°19.17'E	1254	many	136.8	Vernad	anonymous
Dhofar 1595	L5	Oman	Zufar	17 Apr 2004	19°19.38'N	54°32.23'E	130	1	29	Vernad	anonymous
Dhofar 1597	H5	Oman	Zufar	18 Apr 2004	18°57.68'N	54°22.11'E	4558	1	237.3	Vernad.	anonymous
Dhofar 1598	L6	Oman	Zufar	7 Dec 2004	18°33.56'N	54°29.68'E	766	1	258	Vernad	anonymous
Dhofar 1599	H5	Oman	Zufar	29 Nov 2004	18°52.88'N	54°23.92'E	240	1	68.45	Vernad	anonymous
Dhofar 1601	L5	Oman	Zufar	11 Feb 2003	19°11.10'N	54°37.86'E	1166	1	352	Vernad	Vernad
Dhofar 1611	H5	Oman	Zufar	2003 Feb 11	19°08.00'N	54°39.16'E	1124	1	298	Vernad	anonymous
Dhofar 1612	CV3	Oman	Zufar	2010 March 5	18°35'N	54°08'E	124	1	21.3	UAz	R. Ward
Dhofar 1619	CM2	Oman	Zufar	4 March 2007	18°40.475'N	54°26.397'E	6.18	1	3.321	ASU	ASU
Fuhe	L5	China	Hubei	June 1945	31°28'32"N	113°34'01"E	23 kg	1	2300	CUG	Jun Chen
Galleta Flat	H4	United States	Arizona	19 Jul 2009	32°0'14.95"N	110°22'30.09"W	392	1	20.9	UWS	J. Schrader
Gove	Relict iron	Australia	Northern Territory	24 Feb 1979	12°15.8'S	136°50.3'E	unknown	1	1164.8	UCLA	Geoscience Australia
Great Sand Sea 026	H6	Egypt	Marsa Matruh	01 Feb 2007	28°11'21"N	25°37'18"E	100	1	100	OAM	OAM
Great Sand Sea 040	LL5	Egypt	Al Wadi al Jadid	2010	26°19.64'N	27°20.20'E	15	1	3	MSP	OAM
Hammadah al Hamra 341	LL5	Libya	Ghadamis	2001	29°18.65'N	11°36.15'E	1530	14	32	MSP	MSP
Hammadah al Hamra 342	L5	Libya	Gharyan	2001	29°08.52'N	11°53.75'E	482	6	419	MSP	MSP
Hammadah al Hamra 343	H4	Libya	Gharyan	2001	29°06.07'N	12°02.00'E	342	2	311	MSP	MSP
Harper Dry Lake 018	H6	United States	California	6 Jan 2007	35°2.526'N	117°16.507'W	39.7	2	8.1	UCLA	G. Stanley
Harper Dry Lake 029	H6	United States	California	2008 Oct 25	35°2.741'N	117°15.995'W	11.56	1	2.23	UCLA	R. Matson
Hautes Fagnes	LL5	Belgium	Liege	1965	50°35'N	6°10'E	185	1	67	RBINS	V. Jacques
Hyattville	L6	United States	Wyoming	April 2008	44°20.294'N	107°40.443'W	8911	6	24	IfP	see database
Ifould Lake 001	L5	Australia	South Australia	24 Aug 2008	30°51'S	132°05'E	40.9	1	40.9	Monash	Monash
Imlay	L5	United States	Nevada	18 Oct 2009	40°44.411'N	118°10.371'W	770	1	21.8	UCLA	finder
Javorje	Iron, IIIAB	Slovenia		5 Nov 2009	46°9'44.79"N	14°11'29.98"E	4920	1	120	GeoZS	V. Štibelj
Jiddat al Harasis 319	Mesosiderite	Oman	Al Wusta	30 Jan 2007	19°58.633'N	56°25.516'E	4.5	1	0.90	Kiel	Bart
Jiddat al Harasis 360	L-melt rock	Oman	Al Wusta	9 Mar 2003	19°22.338'N	55°33.778'E	55.5	1	11.5	Kiel	anonymous
Jiddat al Harasis 395	Diogenite	Oman	Al Wusta	23 Mar 2000	~19°55'N	~56°15'E	243	1	20.0	Kiel	anonymous
Kemer	L4	Turkey	Mugla	March 3, 2008	36°32'31"N	29°25'05.6"E	5760	3	157.2	CagU	Kasikçi
Laughlin	H5	United States	Arizona	13 Mar 2008	35°10.12'N	114°27.30'W	10	1	2.26	UAz	T.L. Parker
Lavras do Sul	L5	Brazil	Rio Grande do Sul	1985	30°48'S	53°54'W	1000	1	57	MNRJ	A. Roisemberg
Little Harquahala Mountains	H-melt rock	United States	Arizona	Jan 2006	33°41.506'N	113°38.167'W	262.2	14	25.98	ASU	finder

Llano River	Iron, IIIAB	United States	Texas	1975	30°31.328'N	99°44.219'W	4318	1	151.95	ASU	finder
Lorton	L6	United States	Virginia	18 Jan 2010	38.70066°N	77.21163°W	329.7	1	329.7	SI	SI
Lucerne Valley 089	L5	United States	California	2007 May 05	34°29.383'N	116°58.877'W	2.6	1	0.9	UCLA	G. Stanley
Lucerne Valley 090	L5	United States	California	2007 May 05	34°29.294'N	116°58.678'W	30.7	1	8.2	UCLA	M. Waiblinger
Lucerne Valley 091	H4	United States	California	2007 May 20	34°28.845'N	116°58.728'W	12.7	1	2.9	UCLA	MkMorgan
Lucerne Valley 092	H5	United States	California	2007 May 20	34°28.889'N	116°57.195'W	0.6	1	0.6	UCLA	UCLA
Lucerne Valley 093	L6	United States	California	2007 Sep 24	34°29.322'N	116°58.728'W	3.93	1	1.2	UCLA	R. Matson
Lucerne Valley 096	L5	United States	California	2008 Mar 28	34°29.197'N	116°57.384'W	7.3	4	1.4	UCLA	M. Morgan
Lucerne Valley 097	CK4	United States	California	2008 Mar 28	34°29.139'N	116°57.404'W	6.5	5	1.4	UCLA	M. Morgan
Lucerne Valley 101	CK4	United States	California	2008 Mar 29	34°29.159'N	116°57.356'W	4.0	7	0.9	UCLA	P. Desilets
Lucerne Valley 120	L6	United States	California	2010 Feb 03	34°29.033'N	116°57.006'W	43.1	1	8.7	UCLA	G. Stanley
Mason Gully	H5	Australia	Western Australia	13 April 2010			24.54	1	24.54	WAM	WAM
Mifflin	L5	United States	Wisconsin	April 14, 2010	42°54'27"N	90°21'56"W	>3584	>70	21.09	SI	Private collectors
Mount Moroto	L6	Uganda	Karamoja	14 Apr 1995	2°30'N	34°45'E	752	1	26	MNB	anonymous
New Deal	H6	United States	Texas	12 Jun 2010	33°43'15.59"N	101°50'20.04"W	266	1	35.69	UCLA	T. Smith
Nicolás Levalle	L5	Argentina	Buenos Aires	2 Dec 1956	38°51'1"S	62°52'44"W	60 kg	1	22.7	UCLA	Soc. Met. Argentina
Northwest Africa 793	L6	(Northwest Africa)		P 27 Apr 2001			1422	1	35.94	UCLA	M. Farmer
Northwest Africa 798	L6	(Northwest Africa)		P 27 Apr 2001			4280	1	28.96	UCLA	M. Farmer
Northwest Africa 799	LL6	(Northwest Africa)		P 27 Apr 2001			1850	1	60.82	UCLA	M. Farmer
Northwest Africa 800	R4	(Northwest Africa)		P 27 Apr 2001			198.4	1	21.27	UCLA	M. Farmer
Northwest Africa 803	L6	(Northwest Africa)		P 28 Apr 2001			6870	3	45.11	UCLA	M. Farmer
Northwest Africa 806	LL4	(Northwest Africa)		P 29 Apr 2001			320	1	20.85	UCLA	M. Farmer
Northwest Africa 807	L6	(Northwest Africa)		P 27 Apr 2001			547	1	30.43	UCLA	M. Farmer
Northwest Africa 808	L6	(Northwest Africa)		P 27 Apr 2001			800	1	54.49	UCLA	M. Farmer
Northwest Africa 809	L6	(Northwest Africa)		P 27 Apr 2001			359	1	66.11	UCLA	M. Farmer
Northwest Africa 812	H5	(Northwest Africa)		P 29 Apr 2001			382	1	64.54	UCLA	M. Farmer
Northwest Africa 815	LL6	(Northwest Africa)		P 29 Apr 2001			712	1	99.38	UCLA	M. Farmer
Northwest Africa 819	H6	(Northwest Africa)		P 20 Sept 2000			254	1	20.96	UCLA	M. Farmer
Northwest Africa 901	H5	(Northwest Africa)		P 2005			278	1	21.6	MSP	Chinellato
Northwest Africa 959	Iron, IVA	(Northwest Africa)		unknown			415	1	22.7	UCLA	GHupé
Northwest Africa 968	Iron, IAB-sLH	(Northwest Africa)		unknown			20	1	4.1	UCLA	GHupé
Northwest Africa 1007	L6	(Northwest Africa)		P unknown			4420	1	233.43	UCLA	M. Farmer
Northwest Africa 1611	Iron, IAB-MG	(Northwest Africa)		unknown			6000	1	77	UCLA	Carion
Northwest Africa 2220	Eucrite	(Northwest Africa)		P Aug 2003			241	1	21	UWS	ROM
Northwest Africa 2311	Iron, IAB-sLL	(Northwest Africa)		2004			1435	1	55.6	UCLA	HallF
Northwest Africa 2676	Mesosiderite	Morocco		2004			510	1	28	UCLA	Birdsell
Northwest Africa 2678	Iron, IIAB	Morocco		P 2004			381	1	28	UCLA	Birdsell
Northwest Africa 2679	Iron, IAB-sHL	Morocco		2004			512	1	24	UCLA	Birdsell
Northwest Africa 2680	Iron, IAB-sLH	Morocco		P 2005			12.05 kg	1	40	UCLA	Birdsell
Northwest Africa 2734	L4	Morocco		P 2005			277	1	48.6	NAU	J. Kuyken
Northwest Africa 2743	Iron, IC	Morocco		2005			5463	1	212	UCLA	Birdsell
Northwest Africa 3191	LL5	Morocco		P Jan 2003			263.09	1	23.4	UCLA	Utas
Northwest Africa 3192	CV3	Algeria		P Feb 2005			22.5	several	4.67	UCLA	Utas
Northwest Africa 3200	Iron, IAB-sHL	(Northwest Africa)		unknown			512	1	30	UCLA	Utas
Northwest Africa 3201	Iron, IIAB	(Northwest Africa)		unknown			1896	1	119	UCLA	Utas
Northwest Africa 3202	Iron, IIAB	(Northwest Africa)		unknown			395	1	32.5	UCLA	Utas
Northwest Africa 3204	Iron, IAB-sHL-an	(Northwest Africa)		unknown			762	1	25.9	UCLA	Utas
Northwest Africa 3205	Iron, IAB-ung	(Northwest Africa)		unknown			1374	1	85.4	UCLA	Utas
Northwest Africa 3206	Iron, IAB-sLH	(Northwest Africa)		unknown			174	1	23.1	UCLA	Utas
Northwest Africa 3208	Iron, IIIAB	(Northwest Africa)		unknown			159	1	27	UCLA	Utas
Northwest Africa 4217	Iron, IAB-MG	(Northwest Africa)		P 2006			1013	1	67	UCLA	Birdsell
Northwest Africa 4417	H6	(Northwest Africa)		P 2006			90.1	1	17.8	MSP	Chinellato
Northwest Africa 4428	H4	(Northwest Africa)		P 2006			301.4	1	22.24	MSP	Chinellato

Northwest Africa 4448	Lodranite	Morocco	2005	36.3	1	7.6	NAU	A. Habibi
Northwest Africa 4574	CO3	(Northwest Africa)	P 20 Jun 2006	11	1	2.2	IfP	anonymous
Northwest Africa 4576	Mesosiderite	(Northwest Africa)	P 4 Jan 2005	> 30 kg	many	21.7	IfP	D. Bessey
Northwest Africa 4577	CO3	(Northwest Africa)	P 14 Nov 2004	22	1	4.2	IfP	anonymous
Northwest Africa 4579	CV3	(Northwest Africa)	P 25 Nov 2006	15	1	4.4	IfP	anonymous
Northwest Africa 4583	CO3	(Northwest Africa)	P 11 Mar 2006	53	1	10.0	IfP	anonymous
Northwest Africa 4585	Howardite	(Northwest Africa)	P 11 Mar 2006	71	2	14.2	IfP	anonymous
Northwest Africa 4586	CV3	(Northwest Africa)	P 4 Jan 2005	22	1	4.4	IfP	anonymous
Northwest Africa 4676	CV3 OxA	(Northwest Africa)	P 2007 Feb 3	~10 kg	many	21.7	UAz	M. Sbai
Northwest Africa 4700	Iron, IAB-sLL	(Northwest Africa)	P 2007	3080	1	38	UCLA	Birdsell
Northwest Africa 4701	Iron, IAB complex	(Northwest Africa)	P 2007	1276	1	47	UCLA	Birdsell
Northwest Africa 4702	Iron, ungrouped	(Northwest Africa)	P 2007	123	1	20	UCLA	Birdsell
Northwest Africa 4703	Iron, IAB-sLL	(Northwest Africa)	P 2007	114	1	22	UCLA	Birdsell
Northwest Africa 4704	Iron, IIIE	(Northwest Africa)	P 2007	277	1	21	UCLA	Birdsell
Northwest Africa 4705	Iron, ungrouped	(Northwest Africa)	P 2006	195	1	26	UCLA	Birdsell
Northwest Africa 4706	Iron, IAB-sHL	(Northwest Africa)	P 2006	227	1	22	UCLA	Birdsell
Northwest Africa 4707	Iron, IIIAB	(Northwest Africa)	P 2006	585	1	33	UCLA	Birdsell
Northwest Africa 4708	Iron, IIIAB	(Northwest Africa)	P 2006	9625	~10	53	UCLA	Birdsell
Northwest Africa 4709	Iron, IAB-MG	(Northwest Africa)	2007	82	1	27	UCLA	Birdsell
Northwest Africa 4710	Iron, IAB-sHL	(Northwest Africa)	P 2006	2340	1	33	UCLA	Birdsell
Northwest Africa 4711	Iron, IAB-sHL	(Northwest Africa)	P 2007	394	1	32	UCLA	Birdsell
Northwest Africa 4713	Iron, IAB-sLM	(Northwest Africa)	2007	154	1	23	UCLA	Birdsell
Northwest Africa 4741	Achondrite-ung	(Northwest Africa)	unknown	20	1	5	UPVI	anonymous
Northwest Africa 4806	H6	Morocco	P 2007	38.2	1	10	UCLA	Kessell
Northwest Africa 4807	Diogenite	(Northwest Africa)	P 29 Apr 2007	16.2708	1	3.3	UAz	M. Farmer
Northwest Africa 4908	Eucrite	(Northwest Africa)	P Prior to 2004	464	1	22.0	Cascadia	Thompson
Northwest Africa 5349	Polymict eucrite	(Northwest Africa)	P Jan 2008	445	1	21	Cascadia	Thompson
Northwest Africa 5350	Howardite	(Northwest Africa)	P Jan 2008	468	1	28	Cascadia	Thompson
Northwest Africa 5351	Monomict eucrite	Morocco	P Dec 2007	139	1	22	Cascadia	Thompson
Northwest Africa 5363	Achondrite-ung	(Northwest Africa)	unknown	2455	many	32	UPVI	M. Ait El Caid
Northwest Africa 5412	L6	(Northwest Africa)	P April 2002	476.4	63	21.24	UCLA	S. Tutorow
Northwest Africa 5413	H5	(Northwest Africa)	P April 2002	1385.4	228	25.7	UCLA	S. Tutorow
Northwest Africa 5414	H5	(Northwest Africa)	P April 2002	153.9	1	30.8	UCLA	S. Tutorow
Northwest Africa 5416	H4	(Northwest Africa)	P April 2002	264.6	1	52.9	UCLA	S. Tutorow
Northwest Africa 5417	LL6	(Northwest Africa)	P April 2002	49.58	1	9.92	UCLA	S. Tutorow
Northwest Africa 5428	L5-6	(Northwest Africa)	P 2005	1026	1	32	IfP	anonymous
Northwest Africa 5430	LL6	(Northwest Africa)	P 2008	295	1	24	IfP	anonymous
Northwest Africa 5432	H5/6	(Northwest Africa)	P 2004	580	1	33	IfP	anonymous
Northwest Africa 5492	Chondrite-ung	(Northwest Africa)	P 2008	593	1	20.7	NAU	M. Farmer, J. Strope
Northwest Africa 5549	Iron, IAB-MG	(Northwest Africa)	unknown	>12 kg	1	297	UCLA	Pitt, Schrader
Northwest Africa 5644	Achondrite-ung	(Northwest Africa)	P Nov 2008	200	1	21	UPVI	Habibi
Northwest Africa 5709	L3	Western Sahara	Unknown	8.1	4	8.1	MCNT	MCNT
Northwest Africa 5710	L5	Western Sahara		344.3	1	344.3	MCNT	MCNT
Northwest Africa 5711	L5	Western Sahara		2140.2	1	2140.2	MCNT	MCNT
Northwest Africa 5713	L5	Morocco		92.5	1	92.5	MCNT	MCNT
Northwest Africa 5714	L5	Morocco		106.3	1	106.3	MCNT	MCNT
Northwest Africa 5716	H6	Morocco	2007	393	1	21	NAU	A. Aaronson
Northwest Africa 5721	Eucrite	Western Sahara	2007	67.5	1	13.8	NAU	anonymous
Northwest Africa 5723	LL6	Morocco	2008	405	1	23	NAU	Anonymous
Northwest Africa 5726	H5	Morocco	2008	46.2	1	10	NAU	Tutrow
Northwest Africa 5727	L6	Morocco	2008	336	1	22	NAU	Tutrow
Northwest Africa 5743	Howardite	(Northwest Africa)	P 2009 Feb	216	1	20.1	UWS	AHupé
Northwest Africa 5794	CO3	(Northwest Africa)	P 10-Dec-2008	321.6	1	24	Senck	anonymous

Northwest Africa 5801	LL4	(Northwest Africa)		P Nov 2006			162.3	1	20.0	UCLA	G. Stanley
Northwest Africa 5930	CV3	(Northwest Africa)		P 1 Apr 2009			525	1	20.0	IfP	anonymous
Northwest Africa 5931	LL3	(Northwest Africa)		P 1 Apr 2009			3370	1	20.5	IfP	anonymous
Northwest Africa 5932	CV3	(Northwest Africa)		P 1 Apr 2009			861	1	24.7	IfP	anonymous
Northwest Africa 5933	CO3	(Northwest Africa)		P 1 Apr 2009			241	1	20.5	IfP	anonymous
Northwest Africa 5934	H4	(Northwest Africa)		P 23 Jun 2009			424	1	19.8	IfP	anonymous
Northwest Africa 5937	Ureilite	(Northwest Africa)		P 19 Jun 2009			36	1	7.4	IfP	anonymous
Northwest Africa 5938	Ureilite	(Northwest Africa)		P 19 Jun 2009			238	1	20.0	IfP	anonymous
Northwest Africa 5953	LL4	(Northwest Africa)		P 2005			1450	1	33.0	Senck	Stehlik
Northwest Africa 5954	EL6	(Northwest Africa)		P 2005			540	1	26.0	Senck	Stehlik
Northwest Africa 5955	H3.8	(Northwest Africa)		P 2005			1400	1	28.0	Senck	Stehlik
Northwest Africa 5958	C3.0-ung	Morocco		2009			286	>10	20.9	UWS	G. Hupe
Northwest Africa 5974	H6	Morocco		P 2009			29 kg	1	56	NAU	M. Farmer
Northwest Africa 5978	L4	Morocco		P 2005			308	1	20.1	NAU	J. Kuyken
Northwest Africa 5979	L4	Morocco		P 2008			200	1	21.6	NAU	J. Kuyken
Northwest Africa 5997	LL4/5	(Northwest Africa)		P 10 Dec 2008			553.8	5	36.4	Senck	anonymous
Northwest Africa 5998	L3	(Northwest Africa)		P 24 Aug 2008			777	1	41	Senck	anonymous
Northwest Africa 5999	Diogenite	(Northwest Africa)		P 12 Apr 2003			78.85	1	13.6	Senck	anonymous
Northwest Africa 6073	Howardite	(Northwest Africa)		P June 2008			24.9	1	6.77	WUSL	L. Labenne
Northwest Africa 6075	Lodranite	(Northwest Africa)		P Aug 2008			194	1	26	UWS	G. Fujihara
Northwest Africa 6076	H5	(Northwest Africa)		P 2006 Jul			119	1	27	UWS	J. Higgins
Northwest Africa 6077	Achondrite-ung	(Northwest Africa)		P Sept 2008			1010	1	26.8	UWS	J. Higgins
Northwest Africa 6078	LL6	(Northwest Africa)		P 2008 Sep			538	1	35.5	UWS	J. Higgins
Northwest Africa 6080	LL4	(Northwest Africa)		P 2008 Sep			6333	1	26.4	UWS	J. Higgins
Northwest Africa 6081	LL4	(Northwest Africa)		P 2008 Sep			530	3	27	UWS	J. Higgins
Northwest Africa 6113	H5	Morocco		2008			758.7	1	97.6	MNHNP	A. El Abbassi
Northwest Africa 6114	L3.8	Morocco		2008			224.8	1	23.7	MNHNP	A. El Abbassi
Northwest Africa 6115	L4	Northwest Africa		2007			29.1	1	29.1	MNHNP	F. Rabast
Northwest Africa 6116	CR	Morocco		P 2002			163	1	24.1	MNHNP	Zimmermann
Northwest Africa 6117	L6	Mauritania		P 2002			1750	1	275.5	MNHNP	L. Callens
Northwest Africa 6118	L6	Morocco		P 2005			710	1	94	MNHNP	L. Callens
Northwest Africa 6119	L3.7	Morocco		P ca. 2002			250	1	21.5	MNHNP	J.C. Ghirimoldi
Northwest Africa 6120	L3.7	Morocco		P ca. 2002			2300	1	20	MNHNP	J.C. Ghirimoldi
Northwest Africa 6121	H4	Morocco		P 2003			289.1	1	289.1	MNHNP	Marthe
Northwest Africa 6122	L5	Morocco		P 2003			41.3	1	41.3	MNHNP	Marthe
Northwest Africa 6123	LL3.8	Morocco		P ca. 2003			20	1	20	MNHNP	Marthe
Northwest Africa 6124	L/LL3-5	Morocco		P 2003			121.3	1	115.7	MNHNP	Marthe
Northwest Africa 6125	L3	Algeria		2006			299.2	1	30	MNHNP	Y. Ouirou
Northwest Africa 6126	H6	Morocco		P 7 Aug 2004			264	1	101.83	MNHNP	D. Breynaert
Northwest Africa 6127	L6	Morocco		P 15 Oct 2005			350	1	29.43	MNHNP	D. Breynaert
Northwest Africa 6128	L3.8	Morocco		P 26 Oct 2005			450	1	86.99	MNHNP	D. Breynaert
Northwest Africa 6129	H6	Morocco	South	P 31 Aug 2007	30°27'22.5"N	05°29'12.2"W	1374.12	1	240.63	MNHNP	D. Breynaert
Northwest Africa 6130	H4	Morocco		P 28 Aug 2007			296.05	1	48.21	MNHNP	D. Breynaert
Northwest Africa 6131	L6	Morocco		P 24 Dec 2008			3178.5	1	133.83	MNHNP	D. Breynaert
Northwest Africa 6132	Eucrite	Morocco		P 24 Dec 2008			146	1	22.42	MNHNP	D. Breynaert
Northwest Africa 6133	Diogenite	Western Sahara		P 1 Jan 2009			178	1	41.15	MNHNP	D. Breynaert
Northwest Africa 6135	LL3.8	Morocco		P 2008			3800	3	24	UCLA	Morgan
Northwest Africa 6136	CO3	Morocco		P 2008			2670	2	21	UCLA	Morgan and Reed
Northwest Africa 6137	LL4	Morocco		P 2008			239	4	20	UCLA	Morgan
Northwest Africa 6138	LL3.7	(Northwest Africa)		P April 2002			79.31	8	16.08	UCLA	S. Tutorow
Northwest Africa 6139	L6	(Northwest Africa)		P April 2002			212.8	1	38.33	UCLA	S. Tutorow
Northwest Africa 6140	L6	(Northwest Africa)		P April 2002			5102.4	181	78.5	UCLA	S. Tutorow
Northwest Africa 6141	H5	(Northwest Africa)		P April 2002			623.9	87	28.34	UCLA	S. Tutorow

Northwest Africa 6142	L6	(Northwest Africa)	P April 2002	238.7	1	27.2	UCLA	S. Tutorow
Northwest Africa 6149	Diogenite-olivine	(Northwest Africa)	P 2009 Dec	225	many	20	UWS	G. Fujihara
Northwest Africa 6150	L5	(Northwest Africa)	P 2008 Sep	544	1	20.1	UWS	B. Scarborough
Northwest Africa 6154	H4	(Northwest Africa)	P 2010 Jan	74.2	1	19	UWS	H. Strufe
Northwest Africa 6155	CK5	(Northwest Africa)	P Jan 2010	53	2	12.2	UWS	D. Goettlich
Northwest Africa 6156	CO3.3	(Northwest Africa)	P Feb 2010	76.5	1	15.3	UWS	G. Hupe
Northwest Africa 6158	Ureilite	(Northwest Africa)	P Feb 2010	560	1	20	UWS	D. Stimpson
Northwest Africa 6159	CV3	(Northwest Africa)	P 2009	662	1	21.9	UWS	M. Martin
Northwest Africa 6160	L6	(Northwest Africa)	P 2010 Jan	333	1	23.6	UWS	M. Martin
Northwest Africa 6161	LL6	(Northwest Africa)	P 2009	259	1	23	UWS	D. Bowers
Northwest Africa 6162	Martian (shergottite)	Northwest Africa	2009 Mar	89	1	17.8	UWS	S. Ralew
Northwest Africa 6163	Iron, ungrouped	(Northwest Africa)	P Oct 2008	358	1	39.5	DST-PI	M. Graul
Northwest Africa 6164	Iron, IAB-MG	(Northwest Africa)	P Dec 2007	726	1	28.1	DST-PI	M. Graul
Northwest Africa 6165	Iron, IAB-sLM	(Northwest Africa)	P Dec 2003	29	1	5.5	DST-PI	F. Kuntz
Northwest Africa 6166	Iron, ungrouped	(Northwest Africa)	P 2005	144	1	21.4	DST-PI	F. Kuntz
Northwest Africa 6167	Iron, ungrouped	(Northwest Africa)	P 2003	500	1	21.8	DST-PI	F. Kuntz
Northwest Africa 6182	L4	Morocco	P 2009	197	1	31	NAU	A. Habibi
Northwest Africa 6183	L4	Morocco	P 2009	328	1	22	NAU	A. Habibi
Northwest Africa 6185	LL5	Morocco	P 2009	180	1	27	NAU	A. Habibi
Northwest Africa 6194	H5	Morocco	P 2009	2775	1	22	NAU	D. Gregory
Northwest Africa 6195	LL5	Morocco	P 2009	1195	1	22.6	NAU	D. Gregory
Northwest Africa 6196	LL6	Morocco	P 2009	247	1	24.3	NAU	D. Gregory
Northwest Africa 6197	LL6	Morocco	P 2009	339	1	23	NAU	D. Gregory
Northwest Africa 6204	L4-6	Algeria	P Mar 2, 2009	43.5	1	20.1	UAb	T. LeCheminant
Northwest Africa 6205	L3.3	Morocco	P 2008	6.97	1	6.97	UAb	UAb
Northwest Africa 6206	Howardite	Morocco	P 2008	3.03	1	3.03	UAb	UAb
Northwest Africa 6224	H6	(Northwest Africa)	P 2007 Feb	398	1	20	UWS	P. Mani
Northwest Africa 6225	L5	(Northwest Africa)	P 2007 Mar	1934	1	24.7	UWS	D. Stimpson
Northwest Africa 6229	L4	(Northwest Africa)	P 2010 Mar 4	200	1	20	UWS	G. Fujihara
Northwest Africa 6231	CK4	(Northwest Africa)	P 2009 Dec	1724	1	28	UWS	M. Cimala
Northwest Africa 6232	Diogenite-olivine	(Northwest Africa)	P 2010 Mar	800	3	21	UWS	M. Cimala
Northwest Africa 6233	H6	(Northwest Africa)	P 2010 Mar	340	1	20	UWS	M. Cimala
Northwest Africa 6234	Shergottite	Mali	2009	55.7	1	20	UWS	Anonymous
Northwest Africa 6252	Lunar (feld. brec.)	Morocco	2010	113	1	20.3	NAU	anonymous
Northwest Africa 6261	Eucrite-pmict	(Northwest Africa)	P 2009	141	1	21	UWS	C. Giessler
Northwest Africa 6262	Eucrite-mmict	(Northwest Africa)	P 2009	136	3	21	UWS	C. Giessler
Northwest Africa 6264	Eucrite	(Northwest Africa)	P 2010	273	1	20	UWS	C. Giessler
Northwest Africa 6266	Mesosiderite	(Northwest Africa)	P Apr 2010	500	1	20	UWS	M. Cimala
Northwest Africa 6269	Howardite	(Northwest Africa)	P 12 Feb 2010	372	1	23.2	UWS	M. Jost
Northwest Africa 6270	Eucrite-mmict	(Northwest Africa)	P 12 Feb 2010	276	1	20.2	UWS	M. Jost
Northwest Africa 6275	Lunar (feld. brec.)	Mauritania	2009	1.3	5	0.3	UWS	Classen
Northwest Africa 6277	L5	(Northwest Africa)	P 2010 Feb	302	1	20	UWS	B. Scarborough
Northwest Africa 6278	L5	(Northwest Africa)	P 2010 Feb	516	1	20	UWS	B. Scarborough
Northwest Africa 6279	Iron, IIAB	Morocco	P 2009 Aug 20	11445	1	23.5	Senck	anonymous
Northwest Africa 6285	LL5	(Northwest Africa)	P 2008 Sep	2211	1	47	UWS	J. Higgins
Northwest Africa 6286	LL6	(Northwest Africa)	P 2010 Jun	488	1	31	UWS	J. Higgins
Northwest Africa 6289	LL4	(Northwest Africa)	P 2010 Jun	3467	1	84	UWS	J. Higgins
Northwest Africa 6291	Angrite	(Northwest Africa)	P 2010 Jun	250	1	20	UWS; App	G. Catterton
Northwest Africa 6332	H5	(Northwest Africa)	P 2002	262.8	2	31.6	UCLA	S. Tutorow
Northwest Africa 6333	L6	(Northwest Africa)	P 2002	610.0	1	37.9	UCLA	S. Tutorow
Northwest Africa 6334	H5	(Northwest Africa)	P 2002	494.1	1	26.8	UCLA	S. Tutorow
Northwest Africa 6335	L6	(Northwest Africa)	P 2002	839.1	80	26.2	UCLA	S. Tutorow
Northwest Africa 6336	LL6	(Northwest Africa)	P 2002	767.4	396	26.3	UCLA	S. Tutorow

Northwest Africa 6337	L6	(Northwest Africa)	P 2002	156.7	1	23.3	UCLA	S. Tutorow
Northwest Africa 6338	L4	(Northwest Africa)	P 2002	153.1	1	28.8	UCLA	S. Tutorow
Northwest Africa 6339	L5	(Northwest Africa)	P 2002	176.1	7	22.1	UCLA	S. Tutorow
Northwest Africa 6342	Shergottite	Algeria	P Apr 2010	72.2	1	14.5	UWS	DPitt
Northwest Africa 6355	Lunar (feld. brec.)	Morocco	June 2009	760	1	20.1	UWS	Morgan
Northwest Africa 6356	Ureilite-pmict	(Northwest Africa)	P 2005	554	1	23	Vernad.	H. Stehlik
Northwest Africa 6357	CV3	(Northwest Africa)	P Oct 2008	109	1	20.86	Vernad	anonymous
Northwest Africa 6358	CV3	(Northwest Africa)	P Oct 2008	186	1	20.15	Vernad	anonymous
Northwest Africa 6361	CV3	Morocco	P 2004	300	1	25	Vernad	H. Stehlik
Northwest Africa 6365	L5	Morocco	P April 2009	48.7	1	11.4	Vernad	Vernad
Northwest Africa 6368	CV3	(Northwest Africa)	P Apr 2009	6000	many	99.5	Vernad	anonymous
Northwest Africa 6396	CK4/5	(Northwest Africa)	P 22 Jun 2010	162	1	20	IfP	anonymous
Northwest Africa 6397	LL6	(Northwest Africa)	P 22 June 2010	215.8	1	23	IfP	anonymous
Northwest Africa 6398	LL6	(Northwest Africa)	P 22 June 2010	372.3	1	25	IfP	anonymous
Northwest Africa 6399	Ureilite	(Northwest Africa)	P 2005	401	1	20	IfP	anonymous
Northwest Africa 6400	LL3-6	(Northwest Africa)	P 2007	850	2	25	IfP	anonymous
Northwest Africa 6427	CR2	Morocco	P Feb 2010	169	1	20.2	SI	Bob Evans
Northwest Africa 6429	CR2	Morocco	P Feb, 2010	253	1	21.6	SI	Bob Evans
Northwest Africa 6453	H6	(Northwest Africa)	P 2006	550	1	21	UCLA	finder
Northwest Africa 6454	L-melt rock	(Northwest Africa)	P Feb 2005	300	1	20.0	Cascadia	Turecki
Northwest Africa 6467	L6	Morocco	P Sept 9, 2009	631.5	1	36.6	UAb	R. Young
Northwest Africa 6470	Lunar (feld. brec.)	Morocco	2009	96	1	19.2	UWS	Utas
Northwest Africa 6481	Lunar (feld. brec.)	Morocco	August 2010	13.7	1	2.8	UWS	Ralew
Northwest Africa 6484	Lodranite	(Northwest Africa)	P June 2010	688	1	78.3	Vernad	anonymous
Northwest Africa 6490	H5	Morocco	2002	80	1	59.5	CEREGE	CEREGE
Northwest Africa 6491	R3-5	(Northwest Africa)	P Summer 2004	1100	11	20.6	Cascadia	Thompson
Northwest Africa 6492	R3-6	(Northwest Africa)	P Jan 2004	~45	1	40.9	Cascadia	Cascadia
Northwest Africa 6513	L4	(Northwest Africa)	2009	4055	1	4050	UTenn	L.A. Taylor
Northwest Africa 6514	LL(L)3.1	(Northwest Africa)	P	3200	1	40	ROM	anonymous
Northwest Africa 6515	Ureilite	(Northwest Africa)	P 2010	2510	1	25	PMO	Ke Zuokai
Northwest Africa 6542	EL6	(Northwest Africa)	P 2005	15.8	1	3.53	OAM	OAM
Northwest Africa 6543	H5	(Northwest Africa)	P 2007	198	1	21.4	MSP	OAM
Northwest Africa 6544	H4	(Northwest Africa)	P 2006	34.75	1	34.75	MSP	MSP
Northwest Africa 6545	H4	(Northwest Africa)	P 2006	361	1	60	MSP	GeoPal
Northwest Africa 6546	L5	(Northwest Africa)	P 2006	214	1	42	MSP	Godone
Northwest Africa 6547	L4	(Northwest Africa)	P 2006	92.2	1	18.8	MSP	Bettini
Northwest Africa 6548	LL4	(Northwest Africa)	P 2010	188	1	188	OAM	OAM
Northwest Africa 6549	L4	(Northwest Africa)	P Jan 2008	228.7	1	20	UCLA	S. Tutorow
Northwest Africa 6550	LL3.7	(Northwest Africa)	P Jan 2008	29.5 kg	40	67.1	UCLA	S. Tutorow
Northwest Africa 6551	H5	(Northwest Africa)	P Jan 2008	113.6	1	20	UCLA	S. Tutorow
Northwest Africa 6552	L6	(Northwest Africa)	P Jan 2008	5824	1	52.1	UCLA	S. Tutorow
Northwest Africa 6554	Lunar (feld. brec.)	Morocco	2010	138	1	20.7	NAU	anonymous
Northwest Africa 6555	Lunar (feld. brec.)	Morocco	2010	29.72	1	6.3	NAU	anonymous
Northwest Africa 6557	Acapulcoite	Morocco	2009	68	1	14	NAU	D. Pitt
Northwest Africa 6570	Lunar (feld. brec.)	Morocco	2010	415	1	20	UWS	A. Aaronson
Northwest Africa 6578	Lunar (feld. brec.)	Morocco	2010	1638	1	20.2	NAU	anonymous
Northwest Africa 6579	L-melt rock	(Northwest Africa)	P July, 2005	95	1	21.1	Cascadia	Reed
Northwest Africa 6580	L-melt breccia	(Northwest Africa)	P Oct 2005	105	1	20.0	Cascadia	Thompson
Northwest Africa 6581	LL6	Morocco	P Feb 2008	146.5	1	21	UCLA	Atkins, Haas
Northwest Africa 6582	LL3.8	Morocco	P Feb 2008	49	1	17.2	UCLA	Atkins
Northwest Africa 6587	H6	(Northwest Africa)	P 2009	307	1	26	UCLA	KKessell
Northwest Africa 6588	LL6-an	(Northwest Africa)	P 2008	2730	1	20	UNM	A. Aaronson
Northwest Africa 6589	Eucrite	(Northwest Africa)	P 2002	286	1	286	UNM	UNM

Northwest Africa 6590	L4	Morocco		P 2010			3950	1	136.3	CEREGE	PThomas
Northwest Africa 6591	H4	Morocco		P April 2010			712	2	20.6	CEREGE	PThomas
Northwest Africa 6592	Lodranite	(Northwest Africa)		P May 2007			15.85	1	3.2	CEREGE	P. Thomas
Northwest Africa 6593	L3	Morocco		P May 2010			635.8	1	31.5	CEREGE	R. Lenssen
Northwest Africa 6594	Eucrite	(Northwest Africa)		P Oct 2010			3050	1	35	PMO	Ke Zuokai
Northwest Africa 6600	Ureilite	Morocco		2010			439	1	25.2	UNM	Thompson
Northwest Africa 6601	Eucrite	Morocco		October 2010			276.2	3	22	UNM	Thompson
Northwest Africa 6693	Achondrite-ung	Morocco		March 2010			5100	1	28.4	UCLA	E. Thompson
Northwest Africa 6694	Eucrite-pmict	Morocco		2009			5005	1	68.4	UCLA	E. Thompson
Northwest Africa 6695	Howardite	Morocco		January 2011			538	24	36.2	UCLA	E. Thompson
Northwest Africa 6696	LL3.6	Morocco		P 2007			10	1	6.30	UCLA	UCLA
Northwest Africa 6697	C2-ung	Mauritania		P 2010			67.05	9	16.9	UCLA	S. Tutorow
Northwest Africa 6698	Achondrite-ung	Morocco		2009			38.4	1	7.7	NAU	A Habibi
Northwest Africa 6704	Achondrite-ung	Algeria		P 2011 Feb-Apr			6595	26	20.5	UWS	G. Hupe
Northwest Africa 6710	Martian (shergottite)	Mali		P 2011 March			74.4	1	15	UWS	S. Ralew
Northwest Africa 6711	Eucrite	(Northwest Africa)		P Sept 2009			714	1	20.5	Cascadia	R. McKenzie
Northwest Africa 6712	Eucrite	(Northwest Africa)		P Sept 2009			3758	2	20.8	Cascadia	R. McKenzie
Northwest Africa 6713	Mesosiderite	Morocco		2010			277	1	25.3	CEREGE	P. Thomas
Northwest Africa 6714	L3.1	(Northwest Africa)		P 2010 Oct 29			93.7	2	22	CEREGE	P. Thomas
Northwest Africa 6715	L6	Morocco		2006			470	1	21	CEREGE	OAM
Northwest Africa 6727	L5	(Northwest Africa)		P 2006			88 kg	5	20	Kiel	S. Buhl
Northwest Africa 6732	L6	(Northwest Africa)		P 2009			200.9	1	20	Kiel	R. Bartoschewitz
Northwest Africa 6733	H5	(Northwest Africa)		P 2009			2335	1	20	Kiel	R. Bartoschewitz
Northwest Africa 6736	L6	(Northwest Africa)		P 2009 Apr			165	1	20	Kiel	anonymous
Northwest Africa 6811	L6	Morocco		2010			1158.2	1	40.19	UCLA	S. Tutorow
Northwest Africa 6812	H5	Morocco		2010			681	1	44.95	UCLA	S. Tutorow
Northwest Africa 6813	LL6	Morocco		2010			155.8	1	28.23	UCLA	S. Tutorow
Northwest Africa 6814	LL6	Morocco		2010			111.45	1	23.28	UCLA	S. Tutorow
Northwest Africa 6815	H6	Morocco		2010			857.3	1	45.36	UCLA	S. Tutorow
Northwest Africa 6816	L6	Morocco		2010			6859.4	44	61.73	UCLA	S. Tutorow
Northwest Africa 6817	Howardite	Western Sahara		2011			1131	1	50	UNM	Piatek, Habibi
Northwest Africa 6849	L5	(Northwest Africa)		P 10 Feb 2010			4300	1	20	NSMT	Hori Mineraology
Northwest Africa 6851	LL6	(Northwest Africa)		P 2003			207.7	1	207.7	UCLA	UCLA
Northwest Africa 6852	LL6	(Northwest Africa)		Feb 2011			1009	1	20.58	UCLA	M. Patel
Nova 006	H5	(unknown)		2004			70	1	16.05	UCLA	Verish
Nova 010	H4 (reduced)	(unknown)		P 20 Mar 2010			51.5	1	11.0	UCLA	G. Stanley
Podolkhovsky	L6	Russia	Volgogradskaya oblast'	Oct 2007	49°40.13´N	42°49.95´E	648	1	134.2	Vernad	see database
Porto Alegre	Iron, IIIE	Brazil	Rio Grande do Sul	2005	30°01'59"S	51°13'48"W	200 kg	1	20	MNRJ	J. Bertoletti
Ramlat as Sahmah 330	L5	Oman	Al Wusta	28 Nov 2004	20°04.75'N	56°19.99'E	1130	1	302	Vernad	anonymous
Ramlat as Sahmah 331	L5	Oman	Al Wusta	27 Nov 2004	20°05.49'N	56°21.45'E	360	1	90.8	Vernad	Vernad
Red Canyon Lake	H5	United States	California	11 Aug 2007	38°8.245'N	119°45.487'W	18.41	1	4.24	ASU	R. Ward
Red Dry Lake 067	L3.4	United States	Arizona	3 March 2009	35°39.521'N	114°1.544'W	6.2	1	2.281	ASU	ASU
Red Dry Lake 068	H4	United States	Arizona	15 Feb 2008	35°38.400'N	114°01.971'W	26.20	1	8.2	UCLA	L. Atkins
Red Dry Lake 071	H6	United States	Arizona	2010 Oct 31	35°37.472'N	114°02.813'W	4.35	2	0.9	UCLA	D. Waterbury
Roach Dry Lake 113	H5	United States	Nevada	23 May 2010	35°39'57.4"N	115°22'14.9"W	39.6	1	13.6	UCLA	finder
Romashki	L6	Russia	Volgogradskaya oblast'	03 Oct 2009	50°17.12'N	46°41.98'E	3400	1	682	Vernad	UHM
San Juan 033	H6	Chile	Antofagasta	7 Sept 2009	25°35'S	69°47'W	357	5	67	CEREGE	Chil
San Juan 034	L6	Chile	Antofagasta	7 Sept 2009	25°35'S	69°47'W	814	7	207	CEREGE	Chil
San Juan 035	H5	Chile	Antofagasta	8 Sept 2009	25°35'S	69°47'W	10.3	1	2.5	CEREGE	Chil
San Juan 036	L6	Chile	Antofagasta	8 Sept 2009	25°35'S	69°47'W	27.6	1	6	CEREGE	Chil
San Juan 037	L5	Chile	Antofagasta	8 Sept 2009	25°35'S	69°47'W	11.4	1	3	CEREGE	Chil
San Juan 038	H5	Chile	Antofagasta	8 Sept 2009	25°35'S	69°47'W	460	3	206	CEREGE	Chil
San Juan 039	L6	Chile	Antofagasta	9 Sept 2009	25°35'S	69°47'W	38.5	1	8	CEREGE	Chil

San Juan 040	H3-5	Chile	Antofagasta	10 Sept 2009	25°35'S	69°47'W	34.5	1	12	CEREGE	Chil
San Juan 041	H/L6	Chile	Antofagasta	10 Sept 2009	25°35'S	69°47'W	88.1	1	23	CEREGE	Chil
San Juan 042	H3	Chile	Antofagasta	14 Sept 2009	25°35'S	69°47'W	13.9	1	3	CEREGE	Chil
San Juan 043	H5	Chile	Antofagasta	14 Sept 2009	25°35'S	69°47'W	26.4	1	6	CEREGE	Chil
San Juan 044	H5	Chile	Antofagasta	14 Sept 2009	25°35'S	69°47'W	120	1	24	CEREGE	Chil
San Juan 045	H3	Chile	Antofagasta	15 Sept 2009	25°35'S	69°47'W	9.9	1	4	CEREGE	Chil
San Juan 046	H5	Chile	Antofagasta	15 Sept 2009	25°35'S	69°47'W	57.4	1	15	CEREGE	Chil
San Juan 047	H5	Chile	Antofagasta	15 Sept 2009	25°35'S	69°47'W	14.1	1	3.8	CEREGE	Chil
San Juan 048	H5	Chile	Antofagasta	16 Sept 2009	25°35'S	69°47'W	10.6	1	2.5	CEREGE	Chil
San Juan 049	H5	Chile	Antofagasta	17 Sept 2009	25°35'S	69°47'W	41.8	1	9	CEREGE	Chil
San Juan 050	H6	Chile	Antofagasta	17 Sept 2009	25°35'S	69°47'W	29.4	2	11	CEREGE	Chil
San Juan 051	H5	Chile	Antofagasta	17 Sept 2009	25°35'S	69°47'W	117	1	37	CEREGE	Chil
San Juan 052	L3	Chile	Antofagasta	17 Sept 2009	25°35'S	69°47'W	49	1	15	CEREGE	Chil
Sayh al Uhaymir 427	CV3	Oman	Al Wusta	16 Feb 2001	21°5.086'N	57°16.559'E	59.0	3	11.80	Kiel	anonymous
Sayh al Uhaymir 484	L6	Oman	Al Wusta	27 Nov 2008	20°47.17'N	57°08.98'E	908	1	48	UWS	M. Farmer
Sayh al Uhaymir 493	Achondrite-ung	Oman	Al Wusta	5 Apr 2009	20°32'N	57°18'E	134	1	20.1	UWS	M. Farmer
Sayh al Uhaymir 494	H4	Oman	Al Wusta	10 Jan 2008	20°11.92'N	56°48.55'E	149	1	28	UWS	M. Farmer
Sayh al Uhaymir 495	H6	Oman	Al Wusta	13 Jan 2008	20°42.15'N	57°06.67'E	92	1	18.4	UWS	M. Farmer
Sayh al Uhaymir 496	H4	Oman	Al Wusta	05 Apr 2009	20°31.67'N	57°24.27'E	732	1	58	UWS	M. Farmer
Sayh al Uhaymir 497	L6	Oman	Al Wusta	03 Apr 2009	20°12.70'N	56°36.28'E	415	1	43	UWS	M. Farmer
Sayh al Uhaymir 498	L5	Oman	Al Wusta	05 Apr 2009	20°31.92'N	57°20.10'E	4053	1	98	UWS	Anonymous
Sayh al Uhaymir 499	H5	Oman	Al Wusta	11 Apr 2009	20°45.88'N	57°16.18'E	15.9 kg	1	22.1	UWS	Anonymous
Sayh al Uhaymir 500	H6	Oman	Al Wusta	03 Apr 2009	20°07.57'N	56°33.77'E	1269	1	23.4	UWS	Anonymous
Sayh al Uhaymir 501	H6	Oman	Al Wusta	11 Apr 2009	20°47.12'N	57°16.12'E	954	1	22.8	UWS	M. Farmer
Sayh al Uhaymir 502	L5	Oman	Al Wusta	05 Apr 2009	20°31.80'N	57°22.02'E	541	1	28	UWS	M. Farmer
Shahdad	H5	Iran	Kerman	2005	30°33.23'N	57°47.05'E	1074	1	20	UCLA	AUT-Iran
Shawnee	Iron, IAB-MG	United States	Kansas	P 2010			8181	1	144.6	ASU	Kansas Met. Soc.
Shişr 162	Lunar (feld. brec.)	Oman	Zufar	17 Feb 2006	18°34'N	53°50'E	5525.0	1	20.0	Kiel	anonymous
Shişr 168	H5	Oman	Zufar	14 Apr 2004	18°36.40'N	53°57.07'E	12.7 kg	many	1086	Vernad.	anonymous
Shişr 169	H5	Oman	Zufar	14 Apr 2004	18°36.25'N	53°58.10'E	1304	1	268	Vernad.	anonymous
Stump Spring 083	LL6	United States	Nevada	3 Mar 2010	35°59'14.22"N	115°50'89.82"W	13.7 kg	1	20.4	NAU	Deiro and Clary
Varre-Sai	L5	Brazil	Rio de Janeiro	19 June 2010	20°51.041'S	41°44.808'W	2500	5	35	MNRJ	Germano and MNRJ
Watson 003	H4	Australia	South Australia	26 Aug 2008	30°29'S	131°33'E	2.6	1	2.6	Monash	Monash
Watson 004	H4	Australia	South Australia	26 Aug 2008	30°29'S	131°33'E	1.3	1	1.3	Monash	Monash
Watson 005	H5	Australia	South Australia	9 May 2009	30°30'S	131°42'E	1.6	1	1.6	Monash	Monash
Watson 006	L5	Australia	South Australia	9 May 2009	30°30'S	131°42'E	53	2	53	Monash	Monash
Watson 007	EL3	Australia	South Australia	10 May 2009	30°29'S	131°41'E	19.5	1	19.5	Monash	Monash
Watson 008	H5	Australia	South Australia	10 May 2009	30°30'S	131°41'E	1.5	1	1.5	Monash	Monash
Watson 009	H5	Australia	South Australia	10 May 2009	30°30'S	131°41'E	1	1	1	Monash	Monash
Watson 010	H5	Australia	South Australia	11 May 2009	30°30'S	131°43'E	19.3	1	19.3	Monash	Monash
Watson 011	H4	Australia	South Australia	12 May 2009	30°31'S	131°30'E	4.1	1	4.1	Monash	Monash
Watson 012	H7	Australia	South Australia	12 May 2009	30°34'S	131°30'E	103.1	21	103.1	Monash	Monash
Whetstone Mountains	H5	United States	Arizona	21 June 2009	31°57.711'N	110°26.051'W	2138.7	10	20.36	UAz	
Willcox Playa 009	Mesosiderite	United States	Arizona	23 Sept 2009	32°4.6'N	109°50.73'W	160	1	20	LPL	R. Garcia
Yarle Lakes 004	CK4	Australia	South Australia	11 May 2009	30°30'S	131°28'E	4.6	1	4.6	Monash	Monash
Yelland Dry Lake	H4	United States	Nevada	16 May 2007	39°21.04'N	114°24.47'W	76 kg	100s	61.58	UCLA	Sonny Clary

Table 2. Antarctic meteorites in Meteoritical Bulletin 99.

Name	Class	Country	State/Prov	Date	Lat	Long	Mass	Pieces	T.S.	T. S. Loc	Main mass
Allan Hills 09004	How	Antarctica		2009			222		222	JSC	JSC
Dominion Range 08330	L6	Antarctica		2008			18		18	JSC	JSC
Dominion Range 08331	H6	Antarctica		2008			21		21	JSC	JSC
Dominion Range 08332	L6	Antarctica		2008			24		24	JSC	JSC
Dominion Range 08333	LL6	Antarctica		2008			35.6		35.6	JSC	JSC
Dominion Range 08336	LL6	Antarctica		2008			26.1		26.1	JSC	JSC
Dominion Range 08338	L6	Antarctica		2008			19		19	JSC	JSC
Dominion Range 08339	LL6	Antarctica		2008			34.8		34.8	JSC	JSC
Dominion Range 08350	H6	Antarctica		2008			7.2		7.2	JSC	JSC
Dominion Range 08352	H6	Antarctica		2008			14.6		14.6	JSC	JSC
Dominion Range 08354	L6	Antarctica		2008			6.8		6.8	JSC	JSC
Dominion Range 08355	L6	Antarctica		2008			8		8	JSC	JSC
Dominion Range 08356	LL6	Antarctica		2008			11		11	JSC	JSC
Dominion Range 08357	L6	Antarctica		2008			8.9		8.9	JSC	JSC
Dominion Range 08358	L6	Antarctica		2008			9.5		9.5	JSC	JSC
Dominion Range 08359	LL6	Antarctica		2008			21.4		21.4	JSC	JSC
Dominion Range 08370	L6	Antarctica		2008			4.4		4.4	JSC	JSC
Dominion Range 08371	H6	Antarctica		2008			5.2		5.2	JSC	JSC
Dominion Range 08373	H6	Antarctica		2008			4.1		4.1	JSC	JSC
Dominion Range 08374	H6	Antarctica		2008			4.3		4.3	JSC	JSC
Dominion Range 08375	LL6	Antarctica		2008			1.9		1.9	JSC	JSC
Dominion Range 08376	L6	Antarctica		2008			9.1		9.1	JSC	JSC
Dominion Range 08379	L6	Antarctica		2008			1.2		1.2	JSC	JSC
Dominion Range 08391	H6	Antarctica		2008			80.6		80.6	JSC	JSC
Dominion Range 08393	LL6	Antarctica		2008			34.2		34.2	JSC	JSC
Dominion Range 08394	LL6	Antarctica		2008			42.4		42.4	JSC	JSC
Dominion Range 08395	LL6	Antarctica		2008			53.2		53.2	JSC	JSC
Dominion Range 08396	LL5	Antarctica		2008			44.8		44.8	JSC	JSC
Dominion Range 08398	LL5	Antarctica		2008			59.7		59.7	JSC	JSC
Dominion Range 08399	L6	Antarctica		2008			85.5		85.5	JSC	JSC
Dominion Range 08411	LL5	Antarctica		2008			47.4		47.4	JSC	JSC
Dominion Range 08412	LL5	Antarctica		2008			37.7		37.7	JSC	JSC
Dominion Range 08413	LL5	Antarctica		2008			32.5		32.5	JSC	JSC
Dominion Range 08414	H6	Antarctica		2008			42		42	JSC	JSC
Dominion Range 08415	L6	Antarctica		2008			42		42	JSC	JSC
Dominion Range 08416	LL5	Antarctica		2008			82		82	JSC	JSC
Dominion Range 08417	L6	Antarctica		2008			31.5		31.5	JSC	JSC
Dominion Range 08418	L6	Antarctica		2008			29.6		29.6	JSC	JSC
Dominion Range 08419	L5	Antarctica		2008			93		93	JSC	JSC
Dominion Range 08430	LL5	Antarctica		2008			108.7		108.7	JSC	JSC
Dominion Range 08431	LL6	Antarctica		2008			128.9		128.9	JSC	JSC
Dominion Range 08432	LL5	Antarctica		2008			59.8		59.8	JSC	JSC
Dominion Range 08433	LL5	Antarctica		2008			65.9		65.9	JSC	JSC
Dominion Range 08434	LL6	Antarctica		2008			85.6		85.6	JSC	JSC
Dominion Range 08435	H6	Antarctica		2008			60.5		60.5	JSC	JSC
Dominion Range 08436	LL5	Antarctica		2008			147.3		147.3	JSC	JSC
Dominion Range 08437	LL6	Antarctica		2008			45.5		45.5	JSC	JSC
Dominion Range 08438	LL6	Antarctica		2008			113.1		113.1	JSC	JSC
Dominion Range 08439	LL6	Antarctica		2008			106.2		106.2	JSC	JSC
Dominion Range 08510	LL6	Antarctica		2008			166.5		166.5	JSC	JSC

Dominion Range 08511	LL6	Antarctica	2008	124.9	124.9	JSC	JSC
Dominion Range 08512	LL5	Antarctica	2008	208.3	208.3	JSC	JSC
Dominion Range 08513	LL5	Antarctica	2008	102.2	102.2	JSC	JSC
Dominion Range 08514	LL6	Antarctica	2008	67.1	67.1	JSC	JSC
Miller Range 07065	LL6	Antarctica	2007	1.1	1.1	JSC	JSC
Miller Range 07099	CO3	Antarctica	2007	13.1	13.1	JSC	JSC
Miller Range 07193	CO3	Antarctica	2007	67.7	67.7	JSC	JSC
Miller Range 07200	L6	Antarctica	2007	88.6	88.6	JSC	JSC
Miller Range 07201	L5	Antarctica	2007	59.8	59.8	JSC	JSC
Miller Range 07202	LL5	Antarctica	2007	99.1	99.1	JSC	JSC
Miller Range 07203	L6	Antarctica	2007	100.7	100.7	JSC	JSC
Miller Range 07204	H5	Antarctica	2007	244.9	244.9	JSC	JSC
Miller Range 07205	LL5	Antarctica	2007	117.2	117.2	JSC	JSC
Miller Range 07206	H5	Antarctica	2007	119.5	119.5	JSC	JSC
Miller Range 07207	L5	Antarctica	2007	84.4	84.4	JSC	JSC
Miller Range 07208	LL5	Antarctica	2007	191.9	191.9	JSC	JSC
Miller Range 07209	LL5	Antarctica	2007	122.6	122.6	JSC	JSC
Miller Range 07210	H6	Antarctica	2007	32.4	32.4	JSC	JSC
Miller Range 07211	L6	Antarctica	2007	38.2	38.2	JSC	JSC
Miller Range 07212	LL6	Antarctica	2007	32.2	32.2	JSC	JSC
Miller Range 07213	L6	Antarctica	2007	11.5	11.5	JSC	JSC
Miller Range 07214	LL5	Antarctica	2007	20.3	20.3	JSC	JSC
Miller Range 07215	H6	Antarctica	2007	9.9	9.9	JSC	JSC
Miller Range 07217	H5	Antarctica	2007	8	8	JSC	JSC
Miller Range 07219	H6	Antarctica	2007	15.4	15.4	JSC	JSC
Miller Range 07230	H6	Antarctica	2007	21	21	JSC	JSC
Miller Range 07231	LL5	Antarctica	2007	7	7	JSC	JSC
Miller Range 07232	L5	Antarctica	2007	27.8	27.8	JSC	JSC
Miller Range 07233	L6	Antarctica	2007	33.1	33.1	JSC	JSC
Miller Range 07234	L5	Antarctica	2007	29.2	29.2	JSC	JSC
Miller Range 07235	H6	Antarctica	2007	62.9	62.9	JSC	JSC
Miller Range 07237	LL6	Antarctica	2007	9.6	9.6	JSC	JSC
Miller Range 07238	H6	Antarctica	2007	13.2	13.2	JSC	JSC
Miller Range 07239	L5	Antarctica	2007	11.2	11.2	JSC	JSC
Miller Range 07280	L5	Antarctica	2007	18.4	18.4	JSC	JSC
Miller Range 07281	L5	Antarctica	2007	38.9	38.9	JSC	JSC
Miller Range 07282	L6	Antarctica	2007	14.2	14.2	JSC	JSC
Miller Range 07283	L6	Antarctica	2007	14.2	14.2	JSC	JSC
Miller Range 07284	L6	Antarctica	2007	22.1	22.1	JSC	JSC
Miller Range 07285	H5	Antarctica	2007	3	3	JSC	JSC
Miller Range 07286	L6	Antarctica	2007	2.4	2.4	JSC	JSC
Miller Range 07287	L6	Antarctica	2007	18.7	18.7	JSC	JSC
Miller Range 07288	H6	Antarctica	2007	47.9	47.9	JSC	JSC
Miller Range 07289	L6	Antarctica	2007	42.1	42.1	JSC	JSC
Miller Range 07290	L6	Antarctica	2007	32.7	32.7	JSC	JSC
Miller Range 07291	H6	Antarctica	2007	12.3	12.3	JSC	JSC
Miller Range 07292	CO3	Antarctica	2007	15.3	15.3	JSC	JSC
Miller Range 07293	CO3	Antarctica	2007	16.7	16.7	JSC	JSC
Miller Range 07294	LL6	Antarctica	2007	28.3	28.3	JSC	JSC
Miller Range 07295	CO3	Antarctica	2007	15	15	JSC	JSC
Miller Range 07296	H6	Antarctica	2007	28.6	28.6	JSC	JSC
Miller Range 07297	H6	Antarctica	2007	28	28	JSC	JSC
Miller Range 07298	CO3	Antarctica	2007	16	16	JSC	JSC

Miller Range 07299	H6	Antarctica	2007	31.5		31.5	JSC	JSC
Miller Range 07300	CO3	Antarctica	2007	7.1		7.1	JSC	JSC
Miller Range 07302	CO3	Antarctica	2007	5.2		5.2	JSC	JSC
Miller Range 07303	CO3	Antarctica	2007	1.6		1.6	JSC	JSC
Miller Range 07304	CO3	Antarctica	2007	10.7		10.7	JSC	JSC
Miller Range 07305	CK5	Antarctica	2007	2.5		2.5	JSC	JSC
Miller Range 07306	CO3	Antarctica	2007	5.8		5.8	JSC	JSC
Miller Range 07311	CO3	Antarctica	2007	0.7		0.7	JSC	JSC
Miller Range 07313	CO3	Antarctica	2007	1.3		1.3	JSC	JSC
Miller Range 07336	CO3	Antarctica	2007	3.7		3.7	JSC	JSC
Miller Range 07338	CO3	Antarctica	2007	4.9		4.9	JSC	JSC
Miller Range 07340	LL6	Antarctica	2007	63.7		63.7	JSC	JSC
Miller Range 07341	CO3	Antarctica	2007	32		32	JSC	JSC
Miller Range 07343	CO3	Antarctica	2007	25.4		25.4	JSC	JSC
Miller Range 07344	LL6	Antarctica	2007	13.2		13.2	JSC	JSC
Miller Range 07345	H6	Antarctica	2007	28.6		28.6	JSC	JSC
Miller Range 07346	CO3	Antarctica	2007	39.7		39.7	JSC	JSC
Miller Range 07347	H5	Antarctica	2007	37.2		37.2	JSC	JSC
Miller Range 07348	H5	Antarctica	2007	23.1		23.1	JSC	JSC
Miller Range 07349	L5	Antarctica	2007	30.1		30.1	JSC	JSC
Miller Range 07350	CO3	Antarctica	2007	7.4		7.4	JSC	JSC
Miller Range 07351	LL5	Antarctica	2007	9.5		9.5	JSC	JSC
Miller Range 07352	LL6	Antarctica	2007	28.5		28.5	JSC	JSC
Miller Range 07353	H6	Antarctica	2007	50.1		50.1	JSC	JSC
Miller Range 07354	H5	Antarctica	2007	31.9		31.9	JSC	JSC
Miller Range 07355	L5	Antarctica	2007	9.6		9.6	JSC	JSC
Miller Range 07356	CO3	Antarctica	2007	12.3		12.3	JSC	JSC
Miller Range 07357	CO3	Antarctica	2007	10.5		10.5	JSC	JSC
Miller Range 07359	H5	Antarctica	2007	2.8		2.8	JSC	JSC
Miller Range 07380	H5	Antarctica	2007	22.3		22.3	JSC	JSC
Miller Range 07381	H6	Antarctica	2007	21.3		21.3	JSC	JSC
Miller Range 07382	L6	Antarctica	2007	15.9		15.9	JSC	JSC
Miller Range 07384	CO3	Antarctica	2007	28.6		28.6	JSC	JSC
Miller Range 07386	H6	Antarctica	2007	6.7		6.7	JSC	JSC
Miller Range 07387	LL6	Antarctica	2007	15.9		15.9	JSC	JSC
Miller Range 07388	LL6	Antarctica	2007	40.7		40.7	JSC	JSC
Miller Range 07389	CO3	Antarctica	2007	14.4		14.4	JSC	JSC
Miller Range 07403	CV3	Antarctica	2007	0.5		0.5	JSC	JSC
Miller Range 07407	CO3	Antarctica	2007	1.3		1.3	JSC	JSC
Miller Range 07409	Acap/lodranite	Antarctica	2007	2.7	1	2.7	JSC	JSC
Miller Range 07411	CB	Antarctica	2007	14.5		14.5	JSC	JSC
Miller Range 07421	CO3	Antarctica	2007	1.1		1.1	JSC	JSC
Miller Range 07422	LL6	Antarctica	2007	1.3		1.3	JSC	JSC
Miller Range 07423	H6	Antarctica	2007	1.7		1.7	JSC	JSC
Miller Range 07426	H6	Antarctica	2007	7.1		7.1	JSC	JSC
Miller Range 07427	LL6	Antarctica	2007	6.1		6.1	JSC	JSC
Miller Range 07428	H6	Antarctica	2007	0.4		0.4	JSC	JSC
Miller Range 07429	LL6	Antarctica	2007	1.4		1.4	JSC	JSC
Miller Range 07430	LL5	Antarctica	2007	0.8		0.8	JSC	JSC
Miller Range 07431	L6	Antarctica	2007	9.5		9.5	JSC	JSC
Miller Range 07432	L6	Antarctica	2007	0.6		0.6	JSC	JSC
Miller Range 07434	L6	Antarctica	2007	1.1		1.1	JSC	JSC
Miller Range 07435	LL5	Antarctica	2007	9		9	JSC	JSC

Miller Range 07436	LL5	Antarctica	2007	9.3	9.3	JSC	JSC
Miller Range 07437	LL5	Antarctica	2007	9.7	9.7	JSC	JSC
Miller Range 07438	L5	Antarctica	2007	2.5	2.5	JSC	JSC
Miller Range 07441	L6	Antarctica	2007	36.3	36.3	JSC	JSC
Miller Range 07442	L5	Antarctica	2007	31.1	31.1	JSC	JSC
Miller Range 07443	LL5	Antarctica	2007	27.7	27.7	JSC	JSC
Miller Range 07446	L5	Antarctica	2007	17.8	17.8	JSC	JSC
Miller Range 07449	LL6	Antarctica	2007	32	32	JSC	JSC
Miller Range 07450	L5	Antarctica	2007	16.4	16.4	JSC	JSC
Miller Range 07452	L6	Antarctica	2007	21.9	21.9	JSC	JSC
Miller Range 07453	H6	Antarctica	2007	11.8	11.8	JSC	JSC
Miller Range 07454	LL6	Antarctica	2007	16	16	JSC	JSC
Miller Range 07455	LL6	Antarctica	2007	16.2	16.2	JSC	JSC
Miller Range 07457	LL6	Antarctica	2007	28.5	28.5	JSC	JSC
Miller Range 07458	H6	Antarctica	2007	12.2	12.2	JSC	JSC
Miller Range 07461	L6	Antarctica	2007	12.6	12.6	JSC	JSC
Miller Range 07462	L5	Antarctica	2007	36.9	36.9	JSC	JSC
Miller Range 07463	L6	Antarctica	2007	54.6	54.6	JSC	JSC
Miller Range 07464	H5	Antarctica	2007	9.6	9.6	JSC	JSC
Miller Range 07465	H5	Antarctica	2007	17.8	17.8	JSC	JSC
Miller Range 07466	H6	Antarctica	2007	11.6	11.6	JSC	JSC
Miller Range 07467	LL6	Antarctica	2007	10.9	10.9	JSC	JSC
Miller Range 07468	H5	Antarctica	2007	14.4	14.4	JSC	JSC
Miller Range 07469	H6	Antarctica	2007	11.1	11.1	JSC	JSC
Miller Range 07470	LL5	Antarctica	2007	12.4	12.4	JSC	JSC
Miller Range 07471	L5	Antarctica	2007	28.5	28.5	JSC	JSC
Miller Range 07472	L6	Antarctica	2007	16.1	16.1	JSC	JSC
Miller Range 07474	H5	Antarctica	2007	23	23	JSC	JSC
Miller Range 07475	LL5	Antarctica	2007	14.8	14.8	JSC	JSC
Miller Range 07476	H5	Antarctica	2007	7.1	7.1	JSC	JSC
Miller Range 07477	LL6	Antarctica	2007	2.3	2.3	JSC	JSC
Miller Range 07478	L5	Antarctica	2007	21.5	21.5	JSC	JSC
Miller Range 07479	LL6	Antarctica	2007	23	23	JSC	JSC
Miller Range 07480	H6	Antarctica	2007	1.6	1.6	JSC	JSC
Miller Range 07481	H5	Antarctica	2007	17.3	17.3	JSC	JSC
Miller Range 07482	L5	Antarctica	2007	9.3	9.3	JSC	JSC
Miller Range 07483	L6	Antarctica	2007	2.8	2.8	JSC	JSC
Miller Range 07484	L6	Antarctica	2007	1.4	1.4	JSC	JSC
Miller Range 07491	L6	Antarctica	2007	0.4	0.4	JSC	JSC
Miller Range 07493	LL5	Antarctica	2007	1.4	1.4	JSC	JSC
Miller Range 07494	L5	Antarctica	2007	8.9	8.9	JSC	JSC
Miller Range 07495	H5	Antarctica	2007	2.9	2.9	JSC	JSC
Miller Range 07496	H6	Antarctica	2007	8.5	8.5	JSC	JSC
Miller Range 07498	L5	Antarctica	2007	18.8	18.8	JSC	JSC
Miller Range 07499	H6	Antarctica	2007	6.6	6.6	JSC	JSC
Miller Range 07505	CO3	Antarctica	2007	1.8	1.8	JSC	JSC
Miller Range 07506	CO3	Antarctica	2007	5.2	5.2	JSC	JSC
Miller Range 07513	CR2	Antarctica	2007	10.5	10.5	JSC	JSC
Miller Range 07530	H5	Antarctica	2007	2.5	2.5	JSC	JSC
Miller Range 07533	L6	Antarctica	2007	2.4	2.4	JSC	JSC
Miller Range 07534	L5	Antarctica	2007	2.7	2.7	JSC	JSC
Miller Range 07535	H6	Antarctica	2007	4.8	4.8	JSC	JSC
Miller Range 07536	H6	Antarctica	2007	16.2	16.2	JSC	JSC

Miller Range 07537	H6	Antarctica	2007	20.8		20.8	JSC	JSC
Miller Range 07538	LL5	Antarctica	2007	6.1		6.1	JSC	JSC
Miller Range 07539	H6	Antarctica	2007	8		8	JSC	JSC
Miller Range 07540	L6	Antarctica	2007	5		5	JSC	JSC
Miller Range 07541	L5	Antarctica	2007	17		17	JSC	JSC
Miller Range 07542	H6	Antarctica	2007	3		3	JSC	JSC
Miller Range 07543	LL6	Antarctica	2007	8.4		8.4	JSC	JSC
Miller Range 07545	L6	Antarctica	2007	7.4		7.4	JSC	JSC
Miller Range 07547	L6	Antarctica	2007	18.8		18.8	JSC	JSC
Miller Range 07548	LL6	Antarctica	2007	4.2		4.2	JSC	JSC
Miller Range 07549	L6	Antarctica	2007	5.1		5.1	JSC	JSC
Miller Range 07550	L5	Antarctica	2007	0.3		0.3	JSC	JSC
Miller Range 07551	L6	Antarctica	2007	1.3		1.3	JSC	JSC
Miller Range 07553	L5	Antarctica	2007	0.6		0.6	JSC	JSC
Miller Range 07554	H5	Antarctica	2007	0.9		0.9	JSC	JSC
Miller Range 07556	L6	Antarctica	2007	5.6		5.6	JSC	JSC
Miller Range 07557	H6	Antarctica	2007	0.2		0.2	JSC	JSC
Miller Range 07559	H5	Antarctica	2007	3.1		3.1	JSC	JSC
Miller Range 07610	LL6	Antarctica	2007	7.1		7.1	JSC	JSC
Miller Range 07611	L6	Antarctica	2007	9.8		9.8	JSC	JSC
Miller Range 07612	H6	Antarctica	2007	6.1		6.1	JSC	JSC
Miller Range 07614	H5	Antarctica	2007	1.3		1.3	JSC	JSC
Miller Range 07615	L6	Antarctica	2007	2.9		2.9	JSC	JSC
Miller Range 07617	H5	Antarctica	2007	4.3		4.3	JSC	JSC
Miller Range 07618	L5	Antarctica	2007	11.4		11.4	JSC	JSC
Miller Range 07619	L6	Antarctica	2007	8.8		8.8	JSC	JSC
Miller Range 07694	CV3	Antarctica	2007	12.7		12.7	JSC	JSC
Miller Range 07710	L4	Antarctica	2007	147.1		147.1	JSC	JSC
Miller Range 090001	CV3	Antarctica	2009	6290		6290	JSC	JSC
Miller Range 090030	Martian (nakhlite)	Antarctica	2009	452.6		452.6	JSC	JSC
Miller Range 090032	Martian (nakhlite)	Antarctica	2009	532.2		532.2	JSC	JSC
Miller Range 090034	Lunar (anorth)	Antarctica	2009	195.6		195.6	JSC	JSC
Miller Range 090036	Lunar (anorth)	Antarctica	2009	244.8		244.8	JSC	JSC
Miller Range 090070	Lunar (anorth)	Antarctica	2009	137.5		137.5	JSC	JSC
Miller Range 090072	CV3	Antarctica	2009	281.5		281.5	JSC	JSC
Miller Range 090073	CO3	Antarctica	2009	255.5		255.5	JSC	JSC
Miller Range 090074	LL6	Antarctica	2009	136.7		136.7	JSC	JSC
Miller Range 090075	Lunar (anorth)	Antarctica	2009	143.5		143.5	JSC	JSC
Miller Range 090076	Ureilite	Antarctica	2009	377.7		377.7	JSC	JSC
Miller Range 090103	CK5-6	Antarctica	2009	52.6		52.6	JSC	JSC
Miller Range 090105	Diogenite	Antarctica	2009	119.4		119.4	JSC	JSC
Miller Range 090106	Diogenite	Antarctica	2009	115.5		115.5	JSC	JSC
Miller Range 090107	Diogenite	Antarctica	2009	405.2		405.2	JSC	JSC
Miller Range 090136	Martian (nakhlite)	Antarctica	2009	171		171	JSC	JSC
Miller Range 090995	Diogenite	Antarctica	2009	9.8		9.8	JSC	JSC
Miller Range 091010	CV3	Antarctica	2009	51.7		51.7	JSC	JSC
Yamato 981668	Eucrite	Antarctica	1998	20.71	1	20.71	NIPR	NIPR
Yamato 981670	Lodranite	Antarctica	1998	6.98	1	6.98	NIPR	NIPR
Yamato 981672	Eucrite	Antarctica	1998	78.13	1	78.13	NIPR	NIPR
Yamato 981673	Eucrite	Antarctica	1998	16.97	1	16.97	NIPR	NIPR
Yamato 981688	Ureilite	Antarctica	1998	48.26	1	48.26	NIPR	NIPR
Yamato 981710	Diogenite	Antarctica	1998	108.41	1	108.41	NIPR	NIPR
Yamato 981724	Eucrite	Antarctica	1998	137.46	1	137.46	NIPR	NIPR

Yamato 981725	Lodranite	Antarctica	1998	62.99	1	62.99	NIPR	NIPR
Yamato 981734	Eucrite	Antarctica	1998	7.96	1	7.96	NIPR	NIPR
Yamato 981735	Eucrite	Antarctica	1998	283.16	1	283.16	NIPR	NIPR
Yamato 981737	Eucrite	Antarctica	1998	6.29	1	6.29	NIPR	NIPR
Yamato 981738	Eucrite	Antarctica	1998	5.90	1	5.90	NIPR	NIPR
Yamato 981739	Eucrite	Antarctica	1998	19.25	1	19.25	NIPR	NIPR
Yamato 981740	Eucrite	Antarctica	1998	6.92	1	6.92	NIPR	NIPR
Yamato 981741	Eucrite	Antarctica	1998	3.83	1	3.83	NIPR	NIPR
Yamato 981742	Eucrite	Antarctica	1998	89.56	1	89.56	NIPR	NIPR
Yamato 981743	Eucrite	Antarctica	1998	48.30	1	48.30	NIPR	NIPR
Yamato 981750	Ureilite	Antarctica	1998	77.52	1	77.52	NIPR	NIPR
Yamato 981810	Ureilite	Antarctica	1998	137.80	1	137.80	NIPR	NIPR
Yamato 981901	H3	Antarctica	1998	10.50	1	10.50	NIPR	NIPR
Yamato 981904	H6	Antarctica	1998	22.53	1	22.53	NIPR	NIPR
Yamato 981905	H6	Antarctica	1998	12.49	1	12.49	NIPR	NIPR
Yamato 981906	H6	Antarctica	1998	423.45	1	423.45	NIPR	NIPR
Yamato 981907	H5	Antarctica	1998	256.76	1	256.76	NIPR	NIPR
Yamato 981908	H5	Antarctica	1998	81.17	1	81.17	NIPR	NIPR
Yamato 981909	H6	Antarctica	1998	23.82	1	23.82	NIPR	NIPR
Yamato 981910	H6	Antarctica	1998	7.28	1	7.28	NIPR	NIPR
Yamato 981911	H6	Antarctica	1998	5.71	1	5.71	NIPR	NIPR
Yamato 981912	H6	Antarctica	1998	3.86	1	3.86	NIPR	NIPR
Yamato 981914	H6	Antarctica	1998	5.79	1	5.79	NIPR	NIPR
Yamato 981915	H6	Antarctica	1998	3.96	1	3.96	NIPR	NIPR
Yamato 981916	H6	Antarctica	1998	3.65	1	3.65	NIPR	NIPR
Yamato 981921	L6	Antarctica	1998	5.95	1	5.95	NIPR	NIPR
Yamato 981922	H5	Antarctica	1998	52.87	1	52.87	NIPR	NIPR
Yamato 981923	H4	Antarctica	1998	30.14	1	30.14	NIPR	NIPR
Yamato 981924	L6	Antarctica	1998	4.44	1	4.44	NIPR	NIPR
Yamato 981925	H5	Antarctica	1998	11.01	1	11.01	NIPR	NIPR
Yamato 981926	H4	Antarctica	1998	29.46	1	29.46	NIPR	NIPR
Yamato 981927	H4	Antarctica	1998	4.86	1	4.86	NIPR	NIPR
Yamato 981928	L3	Antarctica	1998	12.00	1	12.00	NIPR	NIPR
Yamato 981929	H6	Antarctica	1998	9.80	1	9.80	NIPR	NIPR
Yamato 981931	H6	Antarctica	1998	3.60	1	3.60	NIPR	NIPR
Yamato 981932	H6	Antarctica	1998	5.16	1	5.16	NIPR	NIPR
Yamato 981934	H6	Antarctica	1998	7.90	1	7.90	NIPR	NIPR
Yamato 981935	H6	Antarctica	1998	5.44	1	5.44	NIPR	NIPR
Yamato 981937	H6	Antarctica	1998	29.42	1	29.42	NIPR	NIPR
Yamato 981938	H4	Antarctica	1998	7.35	1	7.35	NIPR	NIPR
Yamato 981939	H6	Antarctica	1998	7.67	1	7.67	NIPR	NIPR
Yamato 981940	H6	Antarctica	1998	4.15	1	4.15	NIPR	NIPR
Yamato 981942	EH3	Antarctica	1998	18.32	1	18.32	NIPR	NIPR
Yamato 981943	H6	Antarctica	1998	4.19	1	4.19	NIPR	NIPR
Yamato 981944	L4	Antarctica	1998	8.36	1	8.36	NIPR	NIPR
Yamato 981945	CM2	Antarctica	1998	6.59	1	6.59	NIPR	NIPR
Yamato 981946	CM2	Antarctica	1998	3.73	1	3.73	NIPR	NIPR
Yamato 981949	H4	Antarctica	1998	9.02	1	9.02	NIPR	NIPR
Yamato 981951	H4	Antarctica	1998	77.32	1	77.32	NIPR	NIPR
Yamato 981952	H6	Antarctica	1998	15.93	1	15.93	NIPR	NIPR
Yamato 981953	H5	Antarctica	1998	10.72	1	10.72	NIPR	NIPR
Yamato 981954	H5	Antarctica	1998	7.40	1	7.40	NIPR	NIPR
Yamato 981956	Diogenite	Antarctica	1998	21.64	1	21.64	NIPR	NIPR

Yamato 981957	H4	Antarctica	1998	111.45	1	111.45	NIPR	NIPR
Yamato 981958	L6	Antarctica	1998	96.75	1	96.75	NIPR	NIPR
Yamato 981960	L6	Antarctica	1998	163.03	1	163.03	NIPR	NIPR
Yamato 981963	H4	Antarctica	1998	85.59	1	85.59	NIPR	NIPR
Yamato 981964	H5	Antarctica	1998	7.52	1	7.52	NIPR	NIPR
Yamato 981971	LL6	Antarctica	1998	10.58	1	10.58	NIPR	NIPR
Yamato 981973	H6	Antarctica	1998	15.68	1	15.68	NIPR	NIPR
Yamato 981974	H6	Antarctica	1998	54.79	1	54.79	NIPR	NIPR
Yamato 981975	CM2	Antarctica	1998	3.45	1	3.45	NIPR	NIPR
Yamato 981976	H5	Antarctica	1998	9.65	1	9.65	NIPR	NIPR
Yamato 981977	H5	Antarctica	1998	5.98	1	5.98	NIPR	NIPR
Yamato 981978	L5	Antarctica	1998	8.91	1	8.91	NIPR	NIPR
Yamato 981979	H5	Antarctica	1998	17.72	1	17.72	NIPR	NIPR
Yamato 981980	H6	Antarctica	1998	5.94	1	5.94	NIPR	NIPR
Yamato 981981	H5	Antarctica	1998	6.65	1	6.65	NIPR	NIPR
Yamato 981982	H5	Antarctica	1998	11.30	1	11.30	NIPR	NIPR
Yamato 981983	H4	Antarctica	1998	5.80	1	5.80	NIPR	NIPR
Yamato 981984	H4	Antarctica	1998	9.29	1	9.29	NIPR	NIPR
Yamato 981988	Lodranite	Antarctica	1998	11.37	1	11.37	NIPR	NIPR
Yamato 981989	H3	Antarctica	1998	16.30	1	16.30	NIPR	NIPR
Yamato 981990	H4	Antarctica	1998	4.11	1	4.11	NIPR	NIPR
Yamato 981991	H4	Antarctica	1998	17.04	1	17.04	NIPR	NIPR
Yamato 981993	L6	Antarctica	1998	7.98	1	7.98	NIPR	NIPR
Yamato 981994	H4	Antarctica	1998	5.33	1	5.33	NIPR	NIPR
Yamato 981995	H4	Antarctica	1998	6.24	1	6.24	NIPR	NIPR
Yamato 981997	H6	Antarctica	1998	4.03	1	4.03	NIPR	NIPR
Yamato 981998	H5	Antarctica	1998	93.94	1	93.94	NIPR	NIPR
Yamato 981999	H6	Antarctica	1998	4.72	1	4.72	NIPR	NIPR
Yamato 982001	L3	Antarctica	1998	4.98	1	4.98	NIPR	NIPR
Yamato 982002	L6	Antarctica	1998	5.23	1	5.23	NIPR	NIPR
Yamato 982003	Acapulcoite	Antarctica	1998	19.84	1	19.84	NIPR	NIPR
Yamato 982004	Acapulcoite	Antarctica	1998	6.17	1	6.17	NIPR	NIPR
Yamato 982005	H6	Antarctica	1998	5.17	1	5.17	NIPR	NIPR
Yamato 982006	L6	Antarctica	1998	14.76	1	14.76	NIPR	NIPR
Yamato 982011	L5	Antarctica	1998	19.48	1	19.48	NIPR	NIPR
Yamato 982012	L4	Antarctica	1998	6.31	1	6.31	NIPR	NIPR
Yamato 982013	H5	Antarctica	1998	46.58	1	46.58	NIPR	NIPR
Yamato 982014	H4	Antarctica	1998	3.19	1	3.19	NIPR	NIPR
Yamato 982016	L3	Antarctica	1998	4.52	1	4.52	NIPR	NIPR
Yamato 982017	L5	Antarctica	1998	70.25	1	70.25	NIPR	NIPR
Yamato 982018	CM2	Antarctica	1998	11.87	1	11.87	NIPR	NIPR
Yamato 982019	H5	Antarctica	1998	4.87	1	4.87	NIPR	NIPR
Yamato 982020	H3	Antarctica	1998	5.96	1	5.96	NIPR	NIPR
Yamato 982021	H4	Antarctica	1998	4.78	1	4.78	NIPR	NIPR
Yamato 982022	H6	Antarctica	1998	130.08	1	130.08	NIPR	NIPR
Yamato 982023	H3	Antarctica	1998	36.18	1	36.18	NIPR	NIPR
Yamato 982025	H4	Antarctica	1998	20.82	1	20.82	NIPR	NIPR
Yamato 982026	H5	Antarctica	1998	6.39	1	6.39	NIPR	NIPR
Yamato 982027	H3	Antarctica	1998	4.55	1	4.55	NIPR	NIPR
Yamato 982028	H4	Antarctica	1998	3.16	1	3.16	NIPR	NIPR
Yamato 982031	L6	Antarctica	1998	5.60	1	5.60	NIPR	NIPR
Yamato 982033	LL6	Antarctica	1998	5.29	1	5.29	NIPR	NIPR
Yamato 982034	H6	Antarctica	1998	3.79	1	3.79	NIPR	NIPR

Yamato 982037	H6	Antarctica	1998	14.94	1	14.94	NIPR	NIPR
Yamato 982038	H3	Antarctica	1998	51.12	1	51.12	NIPR	NIPR
Yamato 982039	H6	Antarctica	1998	7.14	1	7.14	NIPR	NIPR
Yamato 982040	H4	Antarctica	1998	8.98	1	8.98	NIPR	NIPR
Yamato 982042	H3	Antarctica	1998	112.86	1	112.86	NIPR	NIPR
Yamato 982044	L6	Antarctica	1998	15.04	1	15.04	NIPR	NIPR
Yamato 982046	H4	Antarctica	1998	3.94	1	3.94	NIPR	NIPR
Yamato 982053	H4	Antarctica	1998	9.46	1	9.46	NIPR	NIPR
Yamato 982054	H4	Antarctica	1998	5.66	1	5.66	NIPR	NIPR
Yamato 982068	L3	Antarctica	1998	4.40	1	4.40	NIPR	NIPR
Yamato 982069	CM2	Antarctica	1998	7.59	1	7.59	NIPR	NIPR
Yamato 982070	CM2	Antarctica	1998	3.03	1	3.03	NIPR	NIPR
Yamato 982071	H4	Antarctica	1998	3.74	1	3.74	NIPR	NIPR
Yamato 982074	H3	Antarctica	1998	21.27	1	21.27	NIPR	NIPR
Yamato 982075	H4	Antarctica	1998	4.96	1	4.96	NIPR	NIPR
Yamato 982076	H4	Antarctica	1998	9.36	1	9.36	NIPR	NIPR
Yamato 982077	H4	Antarctica	1998	7.88	1	7.88	NIPR	NIPR
Yamato 982078	H4	Antarctica	1998	5.37	1	5.37	NIPR	NIPR
Yamato 982079	H4	Antarctica	1998	7.14	1	7.14	NIPR	NIPR
Yamato 982080	H4	Antarctica	1998	4.33	1	4.33	NIPR	NIPR
Yamato 982081	H4	Antarctica	1998	1.94	1	1.94	NIPR	NIPR
Yamato 982082	H4	Antarctica	1998	1.22	1	1.22	NIPR	NIPR
Yamato 982083	H4	Antarctica	1998	1.24	1	1.24	NIPR	NIPR
Yamato 982086	CM2	Antarctica	1998	224.72	1	224.72	NIPR	NIPR
Yamato 982088	H4	Antarctica	1998	3.32	1	3.32	NIPR	NIPR
Yamato 982093	L6	Antarctica	1998	4.35	1	4.35	NIPR	NIPR
Yamato 982097	H5	Antarctica	1998	80.42	1	80.42	NIPR	NIPR
Yamato 982098	H6	Antarctica	1998	3.73	1	3.73	NIPR	NIPR
Yamato 982101	H5	Antarctica	1998	4.33	1	4.33	NIPR	NIPR
Yamato 982102	H6	Antarctica	1998	36.61	1	36.61	NIPR	NIPR
Yamato 982103	H4	Antarctica	1998	0.86	1	0.86	NIPR	NIPR
Yamato 982104	H4	Antarctica	1998	0.50	1	0.50	NIPR	NIPR
Yamato 982105	L4	Antarctica	1998	10.22	1	10.22	NIPR	NIPR
Yamato 982106	L6	Antarctica	1998	3.92	1	3.92	NIPR	NIPR
Yamato 982107	L6	Antarctica	1998	3.81	1	3.81	NIPR	NIPR
Yamato 982108	H4	Antarctica	1998	407.82	1	407.82	NIPR	NIPR
Yamato 982109	H5	Antarctica	1998	2000	1	2000	NIPR	NIPR
Yamato 982110	H4	Antarctica	1998	60.15	1	60.15	NIPR	NIPR
Yamato 982111	L5	Antarctica	1998	7.92	1	7.92	NIPR	NIPR
Yamato 982112	H4	Antarctica	1998	9.10	1	9.10	NIPR	NIPR
Yamato 982113	L6	Antarctica	1998	10.78	1	10.78	NIPR	NIPR
Yamato 982114	H4	Antarctica	1998	3.86	1	3.86	NIPR	NIPR
Yamato 982115	L5	Antarctica	1998	3.40	1	3.40	NIPR	NIPR
Yamato 982120	L5	Antarctica	1998	11.34	1	11.34	NIPR	NIPR
Yamato 982121	H3	Antarctica	1998	9.78	1	9.78	NIPR	NIPR
Yamato 982123	L6	Antarctica	1998	101.99	1	101.99	NIPR	NIPR
Yamato 982125	H4	Antarctica	1998	3.68	1	3.68	NIPR	NIPR
Yamato 982126	H4	Antarctica	1998	3.47	1	3.47	NIPR	NIPR
Yamato 982130	H4	Antarctica	1998	4.24	1	4.24	NIPR	NIPR
Yamato 982132	H4	Antarctica	1998	6.82	1	6.82	NIPR	NIPR
Yamato 982133	H4	Antarctica	1998	3.38	1	3.38	NIPR	NIPR
Yamato 982134	H4	Antarctica	1998	4.34	1	4.34	NIPR	NIPR
Yamato 982135	H4	Antarctica	1998	4.01	1	4.01	NIPR	NIPR

Yamato 982137	H5	Antarctica	1998	4.34	1	4.34	NIPR	NIPR
Yamato 982138	H5	Antarctica	1998	3.54	1	3.54	NIPR	NIPR
Yamato 982139	H6	Antarctica	1998	6.04	1	6.04	NIPR	NIPR
Yamato 982140	L6	Antarctica	1998	5.50	1	5.50	NIPR	NIPR
Yamato 982141	H4	Antarctica	1998	3.96	1	3.96	NIPR	NIPR
Yamato 982143	Ureilite	Antarctica	1998	28.50	1	28.50	NIPR	NIPR
Yamato 982144	L3	Antarctica	1998	62.74	1	62.74	NIPR	NIPR
Yamato 982145	L3	Antarctica	1998	7.48	1	7.48	NIPR	NIPR
Yamato 982146	H4	Antarctica	1998	14.99	1	14.99	NIPR	NIPR
Yamato 982148	L6	Antarctica	1998	83.33	1	83.33	NIPR	NIPR
Yamato 982149	L6	Antarctica	1998	52.68	1	52.68	NIPR	NIPR
Yamato 982153	L4	Antarctica	1998	5.71	1	5.71	NIPR	NIPR
Yamato 982155	L4	Antarctica	1998	31.20	1	31.20	NIPR	NIPR
Yamato 982156	L4	Antarctica	1998	16.47	1	16.47	NIPR	NIPR
Yamato 982157	H5	Antarctica	1998	4.89	1	4.89	NIPR	NIPR
Yamato 982159	H5	Antarctica	1998	19.53	1	19.53	NIPR	NIPR
Yamato 982160	H5	Antarctica	1998	36.52	1	36.52	NIPR	NIPR
Yamato 982163	H6	Antarctica	1998	19.03	1	19.03	NIPR	NIPR
Yamato 982164	H6	Antarctica	1998	11.87	1	11.87	NIPR	NIPR
Yamato 982167	H6	Antarctica	1998	3.85	1	3.85	NIPR	NIPR
Yamato 982169	Ureilite	Antarctica	1998	12.07	1	12.07	NIPR	NIPR
Yamato 982170	L3	Antarctica	1998	16.03	1	16.03	NIPR	NIPR
Yamato 982171	L3	Antarctica	1998	8.99	1	8.99	NIPR	NIPR
Yamato 982172	L6	Antarctica	1998	409.17	1	409.17	NIPR	NIPR
Yamato 982173	L6	Antarctica	1998	5.73	1	5.73	NIPR	NIPR
Yamato 982174	L6	Antarctica	1998	1.77	1	1.77	NIPR	NIPR
Yamato 982175	L6	Antarctica	1998	1.10	1	1.10	NIPR	NIPR
Yamato 982176	L6	Antarctica	1998	3.77	1	3.77	NIPR	NIPR
Yamato 982177	L6	Antarctica	1998	34.14	1	34.14	NIPR	NIPR
Yamato 982178	L6	Antarctica	1998	3.07	1	3.07	NIPR	NIPR
Yamato 982179	L4	Antarctica	1998	12.18	1	12.18	NIPR	NIPR
Yamato 982180	L5	Antarctica	1998	116.23	1	116.23	NIPR	NIPR
Yamato 982182	L6	Antarctica	1998	197.59	1	197.59	NIPR	NIPR
Yamato 982183	L6	Antarctica	1998	33.55	1	33.55	NIPR	NIPR
Yamato 982184	H6	Antarctica	1998	28.23	1	28.23	NIPR	NIPR
Yamato 982185	L6	Antarctica	1998	129.35	1	129.35	NIPR	NIPR
Yamato 982187	H4	Antarctica	1998	12.62	1	12.62	NIPR	NIPR
Yamato 982188	H5	Antarctica	1998	9.51	1	9.51	NIPR	NIPR
Yamato 982189	H4	Antarctica	1998	7.83	1	7.83	NIPR	NIPR
Yamato 982190	H4	Antarctica	1998	7.89	1	7.89	NIPR	NIPR
Yamato 982191	H5	Antarctica	1998	6.24	1	6.24	NIPR	NIPR
Yamato 982192	H4	Antarctica	1998	5.75	1	5.75	NIPR	NIPR
Yamato 982193	H4	Antarctica	1998	5.73	1	5.73	NIPR	NIPR
Yamato 982194	H4	Antarctica	1998	4.44	1	4.44	NIPR	NIPR
Yamato 982195	H4	Antarctica	1998	4.42	1	4.42	NIPR	NIPR
Yamato 982196	H4	Antarctica	1998	5.97	1	5.97	NIPR	NIPR
Yamato 982197	H4	Antarctica	1998	3.78	1	3.78	NIPR	NIPR
Yamato 982198	H4	Antarctica	1998	5.47	1	5.47	NIPR	NIPR
Yamato 982199	H4	Antarctica	1998	5.17	1	5.17	NIPR	NIPR
Yamato 982200	H4	Antarctica	1998	5.06	1	5.06	NIPR	NIPR
Yamato 982201	H4	Antarctica	1998	6.43	1	6.43	NIPR	NIPR
Yamato 982202	H4	Antarctica	1998	4.63	1	4.63	NIPR	NIPR
Yamato 982203	H4	Antarctica	1998	5.32	1	5.32	NIPR	NIPR

Yamato 982204	H4	Antarctica	1998	4.64	1	4.64	NIPR	NIPR
Yamato 982205	H4	Antarctica	1998	3.64	1	3.64	NIPR	NIPR
Yamato 982206	H4	Antarctica	1998	3.94	1	3.94	NIPR	NIPR
Yamato 982207	H4	Antarctica	1998	5.31	1	5.31	NIPR	NIPR
Yamato 982208	H4	Antarctica	1998	5.25	1	5.25	NIPR	NIPR
Yamato 982210	H4	Antarctica	1998	3.70	1	3.70	NIPR	NIPR
Yamato 982211	H4	Antarctica	1998	4.70	1	4.70	NIPR	NIPR
Yamato 982212	H4	Antarctica	1998	4.73	1	4.73	NIPR	NIPR
Yamato 982213	H4	Antarctica	1998	4.29	1	4.29	NIPR	NIPR
Yamato 982214	H4	Antarctica	1998	3.87	1	3.87	NIPR	NIPR
Yamato 982215	H4	Antarctica	1998	3.70	1	3.70	NIPR	NIPR
Yamato 982216	H4	Antarctica	1998	3.99	1	3.99	NIPR	NIPR
Yamato 982220	H4	Antarctica	1998	19.49	1	19.49	NIPR	NIPR
Yamato 982221	H4	Antarctica	1998	10.33	1	10.33	NIPR	NIPR
Yamato 982222	H4	Antarctica	1998	9.00	1	9.00	NIPR	NIPR
Yamato 982223	H5	Antarctica	1998	15.27	1	15.27	NIPR	NIPR
Yamato 982224	H5	Antarctica	1998	28.93	1	28.93	NIPR	NIPR
Yamato 982225	H5	Antarctica	1998	7.27	1	7.27	NIPR	NIPR
Yamato 982226	H5	Antarctica	1998	6.31	1	6.31	NIPR	NIPR
Yamato 982229	H4	Antarctica	1998	6.44	1	6.44	NIPR	NIPR
Yamato 982230	H5	Antarctica	1998	78.04	1	78.04	NIPR	NIPR
Yamato 982231	H5	Antarctica	1998	9.14	1	9.14	NIPR	NIPR
Yamato 982232	L3	Antarctica	1998	10.25	1	10.25	NIPR	NIPR
Yamato 982233	L3	Antarctica	1998	65.84	1	65.84	NIPR	NIPR
Yamato 982234	L3	Antarctica	1998	37.11	1	37.11	NIPR	NIPR
Yamato 982235	L3	Antarctica	1998	8.84	1	8.84	NIPR	NIPR
Yamato 982236	H4	Antarctica	1998	19.27	1	19.27	NIPR	NIPR
Yamato 982237	H4	Antarctica	1998	91.20	1	91.20	NIPR	NIPR
Yamato 982238	H4	Antarctica	1998	8.02	1	8.02	NIPR	NIPR
Yamato 982239	H3	Antarctica	1998	5.11	1	5.11	NIPR	NIPR
Yamato 982240	L3	Antarctica	1998	11.58	1	11.58	NIPR	NIPR
Yamato 982241	L5	Antarctica	1998	6.27	1	6.27	NIPR	NIPR
Yamato 982242	L6	Antarctica	1998	4.39	1	4.39	NIPR	NIPR
Yamato 982243	L6	Antarctica	1998	4.59	1	4.59	NIPR	NIPR
Yamato 982244	L6	Antarctica	1998	6.80	1	6.80	NIPR	NIPR
Yamato 982245	L6	Antarctica	1998	6.13	1	6.13	NIPR	NIPR
Yamato 982246	L6	Antarctica	1998	5.86	1	5.86	NIPR	NIPR
Yamato 982247	L6	Antarctica	1998	7.70	1	7.70	NIPR	NIPR
Yamato 982248	L6	Antarctica	1998	6.89	1	6.89	NIPR	NIPR
Yamato 982249	L6	Antarctica	1998	4.71	1	4.71	NIPR	NIPR
Yamato 982250	L6	Antarctica	1998	13.00	1	13.00	NIPR	NIPR
Yamato 982257	H4	Antarctica	1998	4.68	1	4.68	NIPR	NIPR
Yamato 982258	H4	Antarctica	1998	4.09	1	4.09	NIPR	NIPR
Yamato 982262	H4	Antarctica	1998	8.21	1	8.21	NIPR	NIPR
Yamato 982267	H4	Antarctica	1998	7.79	1	7.79	NIPR	NIPR
Yamato 982268	H4	Antarctica	1998	7.79	1	7.79	NIPR	NIPR
Yamato 982272	H4	Antarctica	1998	6.23	1	6.23	NIPR	NIPR
Yamato 982273	H6	Antarctica	1998	7.77	1	7.77	NIPR	NIPR
Yamato 982276	H4	Antarctica	1998	3.20	1	3.20	NIPR	NIPR
Yamato 982279	H5	Antarctica	1998	16.68	1	16.68	NIPR	NIPR
Yamato 982280	Ureilite	Antarctica	1998	74.53	1	74.53	NIPR	NIPR
Yamato 982281	H6	Antarctica	1998	8.05	1	8.05	NIPR	NIPR
Yamato 982282	H4	Antarctica	1998	4.37	1	4.37	NIPR	NIPR

Yamato 982283	H5	Antarctica	1998	3.40	1	3.40	NIPR	NIPR
Yamato 982291	H6	Antarctica	1998	55.24	1	55.24	NIPR	NIPR
Yamato 982292	H6	Antarctica	1998	6.53	1	6.53	NIPR	NIPR
Yamato 982293	H5	Antarctica	1998	5.26	1	5.26	NIPR	NIPR
Yamato 982294	H5	Antarctica	1998	4.79	1	4.79	NIPR	NIPR
Yamato 982295	H5	Antarctica	1998	3.71	1	3.71	NIPR	NIPR
Yamato 982299	H4	Antarctica	1998	3.52	1	3.52	NIPR	NIPR
Yamato 982300	H6	Antarctica	1998	3.59	1	3.59	NIPR	NIPR
Yamato 982302	H4	Antarctica	1998	8.89	1	8.89	NIPR	NIPR
Yamato 982303	H4	Antarctica	1998	18.36	1	18.36	NIPR	NIPR
Yamato 982304	H6	Antarctica	1998	60.74	1	60.74	NIPR	NIPR
Yamato 982305	H6	Antarctica	1998	1.31	1	1.31	NIPR	NIPR
Yamato 982306	H6	Antarctica	1998	0.96	1	0.96	NIPR	NIPR
Yamato 982307	H6	Antarctica	1998	0.54	1	0.54	NIPR	NIPR
Yamato 982308	H6	Antarctica	1998	0.32	1	0.32	NIPR	NIPR
Yamato 982309	H6	Antarctica	1998	0.30	1	0.30	NIPR	NIPR
Yamato 982310	H4	Antarctica	1998	4.85	1	4.85	NIPR	NIPR
Yamato 982312	H4	Antarctica	1998	3.23	1	3.23	NIPR	NIPR
Yamato 982315	H4	Antarctica	1998	108.11	1	108.11	NIPR	NIPR
Yamato 982317	H5	Antarctica	1998	5.36	1	5.36	NIPR	NIPR
Yamato 982318	H5	Antarctica	1998	29.76	1	29.76	NIPR	NIPR
Yamato 982319	H5	Antarctica	1998	8.78	1	8.78	NIPR	NIPR
Yamato 982320	H5	Antarctica	1998	5.98	1	5.98	NIPR	NIPR
Yamato 982321	H5	Antarctica	1998	4.52	1	4.52	NIPR	NIPR
Yamato 982323	H5	Antarctica	1998	82.45	1	82.45	NIPR	NIPR
Yamato 982324	H5	Antarctica	1998	19.25	1	19.25	NIPR	NIPR
Yamato 982325	H5	Antarctica	1998	18.00	1	18.00	NIPR	NIPR
Yamato 982329	H5	Antarctica	1998	3.31	1	3.31	NIPR	NIPR
Yamato 982334	H4	Antarctica	1998	4.11	1	4.11	NIPR	NIPR
Yamato 982335	H5	Antarctica	1998	9.41	1	9.41	NIPR	NIPR
Yamato 982336	H4	Antarctica	1998	11.08	1	11.08	NIPR	NIPR
Yamato 982337	H5	Antarctica	1998	303.38	1	303.38	NIPR	NIPR
Yamato 982338	H5	Antarctica	1998	3.55	1	3.55	NIPR	NIPR
Yamato 982344	H6	Antarctica	1998	5.42	1	5.42	NIPR	NIPR
Yamato 982348	H5	Antarctica	1998	4.27	1	4.27	NIPR	NIPR
Yamato 982349	H5	Antarctica	1998	6.76	1	6.76	NIPR	NIPR
Yamato 982350	L3	Antarctica	1998	4.56	1	4.56	NIPR	NIPR
Yamato 982351	H6	Antarctica	1998	21.64	1	21.64	NIPR	NIPR
Yamato 982352	H4	Antarctica	1998	9.50	1	9.50	NIPR	NIPR
Yamato 982353	H4	Antarctica	1998	13.73	1	13.73	NIPR	NIPR
Yamato 982354	H5	Antarctica	1998	35.61	1	35.61	NIPR	NIPR
Yamato 982356	L6	Antarctica	1998	421.06	1	421.06	NIPR	NIPR
Yamato 982357	H6	Antarctica	1998	3.77	1	3.77	NIPR	NIPR
Yamato 982358	H6	Antarctica	1998	11.66	1	11.66	NIPR	NIPR
Yamato 982359	H4	Antarctica	1998	3.14	1	3.14	NIPR	NIPR
Yamato 982360	H5	Antarctica	1998	3.19	1	3.19	NIPR	NIPR
Yamato 982361	L6	Antarctica	1998	9.12	1	9.12	NIPR	NIPR
Yamato 982363	L6	Antarctica	1998	5.45	1	5.45	NIPR	NIPR
Yamato 982364	H4	Antarctica	1998	5.77	1	5.77	NIPR	NIPR
Yamato 982365	H6	Antarctica	1998	8.40	1	8.40	NIPR	NIPR
Yamato 982366	H4	Antarctica	1998	5.77	1	5.77	NIPR	NIPR
Yamato 982367	L5	Antarctica	1998	21.22	1	21.22	NIPR	NIPR
Yamato 982368	L6	Antarctica	1998	25.51	1	25.51	NIPR	NIPR

Yamato 982369	H4	Antarctica	1998	7.53	1	7.53	NIPR	NIPR
Yamato 982371	H6	Antarctica	1998	7.68	1	7.68	NIPR	NIPR
Yamato 982372	H4	Antarctica	1998	7.20	1	7.20	NIPR	NIPR
Yamato 982373	L4	Antarctica	1998	1.82	1	1.82	NIPR	NIPR
Yamato 982374	L4	Antarctica	1998	6.63	1	6.63	NIPR	NIPR
Yamato 982375	L4	Antarctica	1998	11.31	1	11.31	NIPR	NIPR
Yamato 982376	L4	Antarctica	1998	35.08	1	35.08	NIPR	NIPR
Yamato 982377	L4	Antarctica	1998	252.41	1	252.41	NIPR	NIPR
Yamato 982378	H4	Antarctica	1998	7.13	1	7.13	NIPR	NIPR
Yamato 982379	L6	Antarctica	1998	25.06	1	25.06	NIPR	NIPR
Yamato 982381	L5	Antarctica	1998	643.12	1	643.12	NIPR	NIPR
Yamato 982382	H4	Antarctica	1998	19.31	1	19.31	NIPR	NIPR
Yamato 982383	H5	Antarctica	1998	167.08	1	167.08	NIPR	NIPR
Yamato 982384	H4	Antarctica	1998	224.48	1	224.48	NIPR	NIPR
Yamato 982385	H4	Antarctica	1998	11.42	1	11.42	NIPR	NIPR
Yamato 982386	H4	Antarctica	1998	0.42	1	0.42	NIPR	NIPR
Yamato 982387	H4	Antarctica	1998	0.34	1	0.34	NIPR	NIPR
Yamato 982388	H	Antarctica	1998	66.67	1	66.67	NIPR	NIPR
Yamato 982389	L6	Antarctica	1998	6.38	1	6.38	NIPR	NIPR
Yamato 982390	L6	Antarctica	1998	4.21	1	4.21	NIPR	NIPR
Yamato 982392	E6	Antarctica	1998	94.67	1	94.67	NIPR	NIPR
Yamato 982393	H3	Antarctica	1998	4.35	1	4.35	NIPR	NIPR
Yamato 982394	H6	Antarctica	1998	49.50	1	49.50	NIPR	NIPR
Yamato 982397	L5	Antarctica	1998	5.04	1	5.04	NIPR	NIPR
Yamato 982399	L3	Antarctica	1998	36.30	1	36.30	NIPR	NIPR
Yamato 982400	L3	Antarctica	1998	4.96	1	4.96	NIPR	NIPR
Yamato 002875	Diogenite	Antarctica	2000	10667	1	10667	NIPR	NIPR

Table 3. Meteoritical database changes for meteorites listed in previous Meteoritical Bulletins

Name	Bulletin number	Explanation of change
Northwest Africa 5717	97	Revised writeup
Yaringie Hill	96	Reclassified Tappert et al. (2009) MAPS **44**, 1687
Elephant Moraine 96010	82	Reclassified in AMN 33(1)*
Elephant Moraine 96286	83	Reclassified in AMN 33(1)
Grosvenor Mountains 95633	82	Reclassified in AMN 33(1)
Meteorite Hills 00452	87	Reclassified Grossman and Brearley (2005) MAPS **40**, 87
Meteorite Hills 01017	88	Reclassified in AMN 33(1)
Meteorite Hills 01149	88	Reclassified in AMN 33(1)
Miller Range 07006	96	Reclassified in AMN 33(1)
Thiel Mountains 07006	97	Fixed error in latitude
Thiel Mountains 07013	97	Fixed error in longitude
United Arab Emirates 001	91	Coordinates supplied by D. Hezel, published in MB97
United Arab Emirates 021	98	Corrected longitude
Denver City	55	More conservative recommended class
Northwest Africa 6235	98	Changed official name by vote of NomCom
Northwest Africa 6236	98	Changed official name by vote of NomCom
Northwest Africa 4878	94	The meteorite is a shergottite, T. Bunch, priv. comm.
Northwest Africa 4936	95	Corrected Schrader to JSchrader
Northwest Africa 4704	99	Reclassified from IIIAB by Wasson
Danby Dry Lake	86	Corrected recommended coordinates
Northwest Africa 6234	99	Fixed weight
Allan Hills 09004	99	Officially renamed from 090004 to 09004
Miller Range 07710	99	Added writeup from AMN 34(1)
Miller Range 091010	99	Added writeup from AMN 34(1)
Dar al Gani 1055	99	Change shock level in writeup
Tanezrouft 003	87	Changed classification to that in MB87
Northwest Africa 6854	0	Name assigned to an approved meteorite by mistake.
Kapoeta	-	Assigned to South Sudan
Malakal	50	Assigned to South Sudan
Maridi	30	Assigned to South Sudan
Sainte Rose	65	Changed country to France
Chandler	99	Revised coordinated entered
Northwest Africa 4473	92	Fixed error in mass to agree with text
MacAlpine Hills 02453	89	Reclassified in AMN 34(2)
Jiddat al Harasis 404	95	Added writeup
Jiddat al Harasis 405	95	Added writeup
Jiddat al Harasis 424	95	Added writeup
Fillmore	50	Correction of MB50
Waterville	-	New information received
Inningen	84	Discredited name
White Hills	85	fixed mass listing
Northwest Africa 5429	100	fixed mass
Northwest Africa 6932	100	Fixed composition in writeup

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MB – Meteoritical Bulletin