Antarctic Martian Meteorites at Johnson Space Center. R.. C. Funk[1], C. E. Satterwhite[2], K. Righter[3] and R. Harrington[2] ,[1]GeoControl, JETS, NASA Johnson Space Center (JSC), Mail Code XI2, Houston, TX 77058, USA, rachel.c.funk@nasa.gov, [2]Jacobs, NASA JSC, Mail Code XI2, Houston, TX 77058, USA [3]NASA-JSC, 2101 Nasa Pkwy, Houston, TX 77058

This past year marked the 40th anniversary of the first Martian meteorite found in Antarctica by the ANSMET Antarctic Search for Meteorites) program, ALH 77005. Since then, an additional 14 Martian meteorites have been found by the ANSMET program making for a total of 15 Martian meteorites in the U. S. Antarctic meteorite collection at Johnson Space Center (JSC). Of the 15 meteorites, some have been paired so the 15 meteorites actually represent a total of approximately 9 separate samples.

The first Martian meteorite found by ANSMET was ALH 77005 (482.500 g), a lherzolitic shergottite. When collected, this meteorite was split as a part of the joint expedition with the National Institute of Polar Research (NIPR) Japan. Originally classified as an "achondrite-unique", it was re-classified as a Martian lherzolitic shergottite in 1982 [1]. This meteorite has been allocated to 137 scientists for research and there are 180.934 g remaining at JSC.

Two years later, one of the most significant Martian meteorites of the collection at JSC was found at Elephant Moraine, EET 79001 (7942.000 g), a shergottite. This meteorite is the largest in the Martian collection at JSC and was the largest stony meteorite sample collected during the 1979 season. In addition to its size, this meteorite is of particular interest because it contains a linear contact separating two different igneous lithologies, basaltic and olivine-phyric. EET 79001 has glass inclusions that contain noble gas and nitrogen compositions that are proportionally identical to the Martian atmosphere, as measured by the Viking spacecraft [2]. This discovery helped scientists to identify where the "SNC" meteorite suite had originated, and that we actually possessed Martian samples. This meteorite has been allocated to 205 scientists for research and 5,298.435 g of sample is available.

Five years later, ANSMET found ALH 84001 (1930.900 g), the only Martian orthopyroxenite. This meteorite was initially classified as a diogenite, but was reclassified as a Martian meteorite in 1993 [3,4]. ALH 84001, known as the "Life on Mars" meteorite, sparked debate about whether it contained evidence of Martian life [5] and significantly influenced the field of astrobiology. This sample has been allocated to 179 scientists for research and has 1,424.144 g remaining at JSC.

In 1988, another lherzolitic shergottite was found, LEW 88516, (13.203 g). This meteorite wasn't recognized in the field as an achondrite until it was broken during processing 2 years later. LEW 88516 has been allocated to 55 scientists for research and 5.341 g of this meteorite remains at JSC. Six years later a basaltic shergottite was found in the Queen Alexandra Range, QUE 94201 (12.020 g). This meteorite was believed to be of terrestrial origin until maskelynite was seen in a thin section. QUE 94201 has been allocated to 58 scientists for research and there are 3.629 g of this meteorite left at JSC.

In 2003, the NASA Mars Exploration Program supplemented the ANSMET team with the hopes of finding another Martian meteorite. During this expedition, MIL 03346 (715.200 g) was found. This meteorite is a nakhlite. MIL 03346 has been allocated to 103 scientists for research and there are 575.966g of this sample remaining at JSC. Six years later, 3 more meteorites that have been paired with MIL 03346 were found, MIL 090030 (452.630 g), 090032 (506.92 g) and 090136 (170.980 g). MIL 090030 has been allocated to 23 scientists for research and has 434.420 g remaining at JSC, MIL 090032 has been allocated to 23 scientists for research and has 508.710 g remaining at JSC and MIL 090136 has been allocated to 16 scientists for research and has 156.790 g remaining at JSC.

During the 2004 expedition, 2 identical meteorites were found together on the ice, RBT 04261 (78.763 g) and RBT 04262 (204.600 g). These paired meteorites are olivine-phyric shergottites. RBT 04261 has been allocated to 35 scientists for research and has 32.335 g remaining at JSC. RBT 04262 has been allocated to 49 scientists for research and has 168.196 g remaining. In 2006, another olivine-phyric shergottite was found, LAR 06319 (78.572 g). This meteorite has 60.194 g remaining at JSC and has been allocated to 42 scientists for research. During the 2012 season, 3 more olivine-phyric shergottites were found at Larkman Nunatak, LAR 12011 (701.170 g), LAR 12095 (133.132 g) and LAR 12240 (57.596 g). LAR 12011 is paired with LAR 06319 and LAR 12095 and LAR 12240 are paired with each other. LAR 12011 has been allocated to 22 scientists for research and there are 681.658 g of LAR 12011 remaining at JSC. LAR 12095 has been allocated to 20 scientists for research and has 118.654 g remaining at JSC. LAR 12240 has been allocated to 13 scientists for research and has 52.231 g remaining at JSC.

Martian meteorites are the only samples available from Mars because no mission has returned samples from there to date. All Martian meteorites are crustal rocks with most of them being crystallized magmas, so they are an important source for understanding Martian geological history and volcanism. The ANSMET program has greatly contributed to the scientific community by collecting these meteorites.

References:

[1] Reid A.M. (1982) *SMCES* 24:63.[2] Bogard, D.D. & Johnson, P. (1983) Martian gases in an Antarctic meteorite?. *Science 221*, 221-651-654. [3] Score R. & Mittlefehldt D. W. (1993) *Antarctic Meteorite Newsletter* 16:3. [4] Mittlefehldt D. W. 1994. *Meteoritics & Planet. Sci.*

29:214-221. [5] McKay, D.S. et al. (1996) *Science* 273, 924-928.