Overview of the Antarctic Meteorite Collection at Johnson Space Center

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Introduction: From 1976 to present the ANSMET program has collected more than 23,000 meteorites, 43 teams have been to the ice searching for meteorites in various locations. After collection and packaging the meteorites are shipped to JSC on a freezer truck and remain frozen until they are processed. Due to the pandemic the team did not go to the ice in 2020 or 2021.

The types and numbers of meteorites that have been classified include 975 carbonaceous chondrites, 146 enstatites, 513 achondrites, 68 stony, 127 irons, 30 R chondrites, 7205 H's, 15 L Chondrite Impact Melts, 9198 L's, and 3890 LL's. Although 80-85% of the collected meteorites fall in the ordinary chondrite group, the other ~15% represent rare types of achondrites and carbonaceous chondrites. These rare meteorites include 32 lunar meteorites, 15 Martian meteorites, scores of various types of carbonaceous chondrites, and unique achondrites. The classification is an initial classification, and some meteorites might get reclassified after more extensive research. Also due to the pandemic the lab was closed for most of 2020 and part of 2021, so there are still samples from the 2018 and 2019 field seasons that are unclassified that we are presently processing. JSC has recently acquired a X-CT which can now be used to scan some of the special/unique meteorites to see if anything of scientific value is visible before breaking. Some of these meteorites can be viewed on the Astromaterials website.

The Antarctic meteorites are processed in a cleanroom at JSC in Houston, TX [1]. The meteorites are dried in a nitrogen glove box for 24 to 48 hours. The meteorites are then photographed, measured, weighed and exterior and interior features are described. The meteorite is chipped and a representative sample, either a 1-3 g chip or thin section is sent to the Smithsonian Institution for classification. After classification and approval by the Nomenclature Committee of the Meteoritical Society, they are announced in the Antarctic Meteorite Newsletter [2-3], which is published twice per year (fall and spring) so that scientists may review which meteorites are available to study. Requests for Antarctic Meteorite samples are welcomed from research scientists, regardless of their current state of funding for meteorite studies. To date close to 3800 requests have been submitted for meteorites and approximately 500 investigators worldwide are active in the study of meteorites from the collection. Research on these samples has been published in >1950 peer reviewed articles (through 2021); a listing of papers for any meteorite sample can be generated by accessing http://curator.jsc.nasa.gov/antmet/referencesearch.cfm.

Antarctic meteorite samples requested by scientists can be prepared in several different ways. Most samples are prepared as chips, either using a rock splitter or using a chisel and chipping bowl. In special situations, a researcher may request a meteorite slab in which case the samples are cut using a diamond-bladed bandsaw inside of a dry nitrogen glove box. The meteorites are always cut in a 100% liquid-free environment. Additionally, thin/thick sections of Antarctic meteorites are also prepared at JSC. The meteorite thin section lab at JSC can prepare standard 30-micron thin sections, thick sections of variable thickness (100 to 200 microns), or demountable sections using superglue, all sections are prepared without using water.

New meteorite discoveries by the ANSMET program provide a cost-effective method for obtaining samples of previously unsampled bodies, allowing scientists to learn more about the origin, composition, and evolution of the solar system (e.g., see detailed articles on specific meteorite types in [4]).

References:

[1] http://curator.jsc.nasa.gov/antmet/index.cfm
[2] http://curator.jsc.nasa.gov/antmet/classdb.cfm
[3] http://curator.jsc.nasa.gov/antmet/amn/amn.cfm
[4] *35 seasons of US Antarctic meteorites (1976-2010): a pictorial guide to the collection*. (2014) Righter, K., Corrigan, C., McCoy, T., & Harvey, R. (Eds.). John Wiley & Sons, 320 pp.