**Documentation of destructive analyses on thin sections in the US Antarctic meteorite collection.** K. Righter[1], S.J. Wentworth[2], R.S. Harrington[3], and N.G. Lunning[1]; [1]Mailcode XI2, NASA Johnson Space Center, 2101 NASA Parkway, Houston, TX 77058; kevin.righter-1@nasa.gov, [2]Hepco, Inc., 1500 Bay Area Blvd, Apt X329, Houston, TX 77058; [3]Jacobs-JETS, 2101 NASA Parkway, Houston, TX 77058.

**Introduction:** Detailed studies and analytical measurements are commonly made using thin sections of rocks affixed with epoxy to a slide. Thin sections [1,2] are a convenient medium in which to study rocks and meteorites, and fit into sample holders compatible with many instruments. Thin sections can also be used multiple times by different researchers, and many meteorite thin sections from the US Antarctic meteorite collection, have been utilized by 5 to 6 researchers over their 40 year lifetime. Thin sections are thus a scientifically valuable resource that must be preserved, documented and conserved over time.

Analytical capabilities for meteorite and other sample studies have progressed extensively in the last 20 years, including many different kinds of analysis of high spatial resolution on thin sections. The progression to analysis on small samples has provided new and efficient ways to characterize samples while also preserving more material for future generations to study. While the development of analytical tools has expanded, many of these analyses are destructive in the sense that small pits or holes or other effects of the analysis are created on the thin sections. Preserving material for future generations thus requires recording the effects of multiple analyses on thin sections.

Here we describe the process used for documenting the effects of various analyses on thin sections in the US Antarctic meteorite collection.

**Destructive analytical techniques:** A multitude of new techniques has become available and utilized in the sample science community for nearly 20 years. Some techniques are not necessarily new, but have destructive effects such as micro-coring, micro-drilling, or ion milling. Laser Ablation ICP-MS analyses produce circular holes (15 to 200 microns depending on conditions, elements, etc.) or lines or even rastered patterns on sections that can render some grains or sample area un-analyzable for future studies. Secondary ion mass spectrometry (SIMS) produces small circular or elongate pits or spots that can be up to 15 microns in diameter. Nano-SIMS analyses are smaller and shallower but also leave depressions where material has been sputtered off the surface by the primary beam of O or Cs. Focused ion beam sample preparations are high precision targeted sample removal of variable size, but typical TEM or nanoSIMS liftouts can be ~ 10 microns x 15 microns (or smaller). All of these techniques leave their mark on the sample, and when the analysis has been completed needs to be documented so that curation staff can know whether a future requestor can use the sample for specific analyses or not.

**Recording effects on sections:** In 2003, in recognition of this growing trend of analysis of thin sections, the Meteorite Working Group and US Antarctic Meteorite Curators devised a short form to be required of researchers who carry out destructive analysis on thin sections. This form, title/numbered MF76 following the Apollo F76 for documenting destructive effects on Apollo samples, is a one page form with associated image or images showing the effects of destructive analyses on the section loaned. The form requests the following information: thin section number, analytical technique used (and location of lab), primary beam used (if SIMS), what phases affected, how many analyses per phase. The latter is asked to allow assessment of how many analyzable phases remaining for future studies.

**Examples:** We will present several examples of destructive analyses on our thin sections, and how those effects were documented for our database, including QUE 97008 unequilibrated ordinary chondrite (hundreds of SIMS analyses), MIL 03346 nakhlite (TEM ion milling and FIN liftouts), MIL 05035 (lunar gabbro) (LA-ICP-MS by 2 different PIs), EET 79001 (FIB liftouts on lithology C), GRA 95229 (nano-SIMS analyses and FIB liftouts from matrix areas), and QUE 97001 (microcoring and LA-ICP-MS by two different PIs). We also discuss allocation of the same section of QUE 94201 to multiple PIs for many different analytical measurements between 1995 and the present.

**Future improvements:** The documentation we utilize is really the minimum required to get the basic information of what phases were destroyed and what remain for future analysis. There are many ways it could be improved, and these would require additional staffing and other resources (analytical time, software development, etc.) to implement more broadly. Individual datasets are added to the documentation but are static and can't currently be cross compared spatially on imagery for a section, for example. Having this capability would allow textural context for sections that have multiple datasets.

**References:** 1] Righter K. et al. (2015) 35 Seasons of U.S. Antarctic Meteorites. AGU/Wiley Sp. Pub. 68: 43-64. [2] Harrington R. & Righter K. (2017) Annual MetSoc 80, Abstract #6304.