

### ADVANCES IN COLD CURATION: DEALING WITH DUST.

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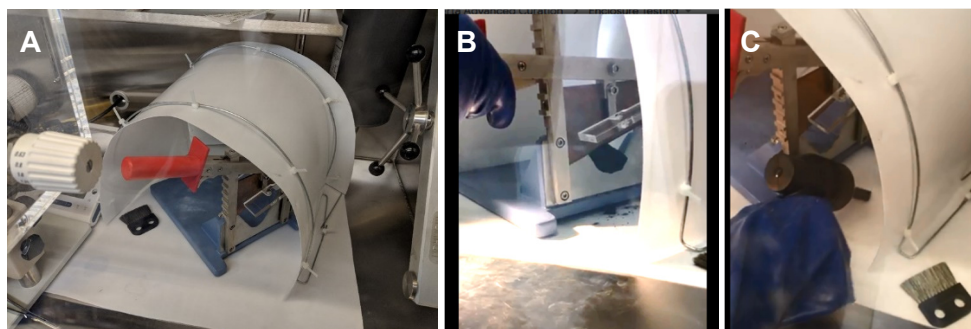
**Introduction:** Modern astromaterials curation routinely involves the use of controlled environment and glove box technology in order to isolate samples from the conditions at the Earth's surface. The advantages of curation of astromaterials under cold conditions are increasingly being realized: curation and handling at temperatures well below standard room temperature, but warm enough to ensure user comfort and safety (i.e., -10 to -20 °C) enables – among other things – the retention of intrinsic volatiles, the inhibition of microbial activity, and the reduction in reaction rates of oxidation and hydrolysis of intrinsic organic compounds and minerals [1]. The Subzero Facility for the Curation of Astromaterials [1] provides a facility in which to develop and test cold curation methods that are potentially applicable to a wide range of astromaterials, such as freshly fallen meteorites (including the Hamburg meteorite, [2]), and those from sample return missions. Here we report on a study of best methods for mitigation of dust during processing of the Tagish Lake meteorite within the Subzero Facility.

**The Tagish Lake Dust Problem:** The Tagish Lake C2 ungrouped chondrite is exceptionally friable and porous; subsampling has routinely been carried out within the Ar glove box at -10 °C using sterile scalpels rinsed in ultrapure water prior to use [e.g., 3]. Processing of larger specimens in recent years has been accomplished using a guillotine cutter (HSE Harvard Apparatus). The friable nature of the meteorite results in a significant amount of dust and small fragments generated during subsampling, especially using the guillotine. This material represents a loss of sample, either because it cannot be readily recovered, or because what is recovered has come into contact with the interior of the glove box and is therefore contaminated. Furthermore, the dust represents a potential source of cross-contamination between Tagish Lake lithologies [4] or between different samples processed within the glove box.

**Methods:** All materials used in this study were carefully cleaned with ultrapure water and/or dichloromethane (DCM) prior to use within the glove box. HPLC-grade DCM was used as a solvent for potential organic contaminants, via soaking of cotton-tipped swabs, for most materials; ultrapure methanol was used for testing of the keyboard vacuum due to the solubility of the plastic in DCM. Two mL of either DCM or methanol were added to the swab tips and analyzed by GC-MS at MacEwan University following the methods of [3].

**Guillotine Enclosure.** In order to mitigate the spreading of dust and small fragments during guillotine cutting, we constructed an enclosure for the guillotine cutter using 0.8 mm thick Teflon sheets mounted using zip ties to an aluminum wire frame (Figure 1a). The enclosure is just large enough to enable the use of the guillotine, which was tested on a specimen of the Tagish Lake meteorite (Fig. 1b) inside the glove box under Ar at -10 °C. A Teflon sheet was used as a base beneath the guillotine and enclosure in order to facilitate collection of material.

**Mini Portable Vacuum Cleaner.** We used a handheld (e.g., keyboard) vacuum cleaner to test the collection of dust generated by cutting of the same Tagish Lake specimen (Fig. 1c). The advantage of the vacuum is that has a relatively simple design, and is powered by a Li-ion battery. The cloth dust filter was replaced by Kimwipe cut to fit.



**Figure 1.** Photos of the guillotine enclosure and vacuum in use with Tagish Lake (UAb specimen MET11611/P-10a)

**Results and Conclusions:** The combination of guillotine enclosure and handheld vacuum enabled the collection of most of the dust and small fragments generated during cutting of the Tagish Lake specimen (a total of 0.17 g) with the exception of a small amount of dust adhered to the Teflon base which could not be recovered, and dust trapped within the filter of the vacuum. None of the materials were found to have detectable organic contaminants.

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**References:** [1] Herd C.D.K. et al. (2016) *Meteoritics & Planetary Science* 51:499-519. [2] Fries M.D. et al. (2019) *This Meeting*. [3] Hilts R.W. et al. (2014) *Meteoritics & Planetary Science* 49:526-549. [4] Herd C.D.K. et al. (2011) *Science* 332:1304-1307.