



CAPTEM March 24, 2018

Astromaterials Acquisition and Curation Overview

Francis McCubbin



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Astromaterials Curation Office Updates



- Dr. Julie Mitchell has returned to JSC and is working full time within advanced curation as the lead on cold curation and the Curator of planetary ices and organics
- Marc Fries has taken over as Cosmic Dust Curator for Michael Zolensky, and Marc has been working closely with Mike over the last several months, ensuring a smooth transition
- Anne Kascak will be retiring in the next few weeks. Anne has been a vital member of curation. We wish her all the best going forward.
- Darren Locke is now the project lead for advanced curation on the contract side, and he is working closely with FM and RZ to ensure success in our advanced curation efforts
- We require additional lab support in advanced curation in the area of geomicrobiology/medical geology, so we anticipate that Jacobs will hire an additional contractor to work in the biolabs

Curation Support to New Missions



OSIRIS REx & Hayabusa 2

- We will begin construction for both labs in FY 2019
- H2 has reported a visual on Ryugu
- O-REx continues to operate nominally, and it is scheduled to rendezvous with Bennu in August

Mars 2020

- Andrea Harrington is Mars Sample Curator and has drafted a curation plan for archiving witness materials and coupons. We are awaiting direction from NASA HQ on how Curation and Mars 2020 Project interactions shall proceed. Once decided, we will ask CAPTEM to review the curation plan.
- Obtained -80 freezer that will be used to store biological CK for Mars 2020
- Francis McCubbin continues as ex-officio member of the Mars 2020 Return Sample Science (RSS) Board and the chair of the Contamination Control and Planetary Protection Working Group (CCPPWG) for Mars 2020.

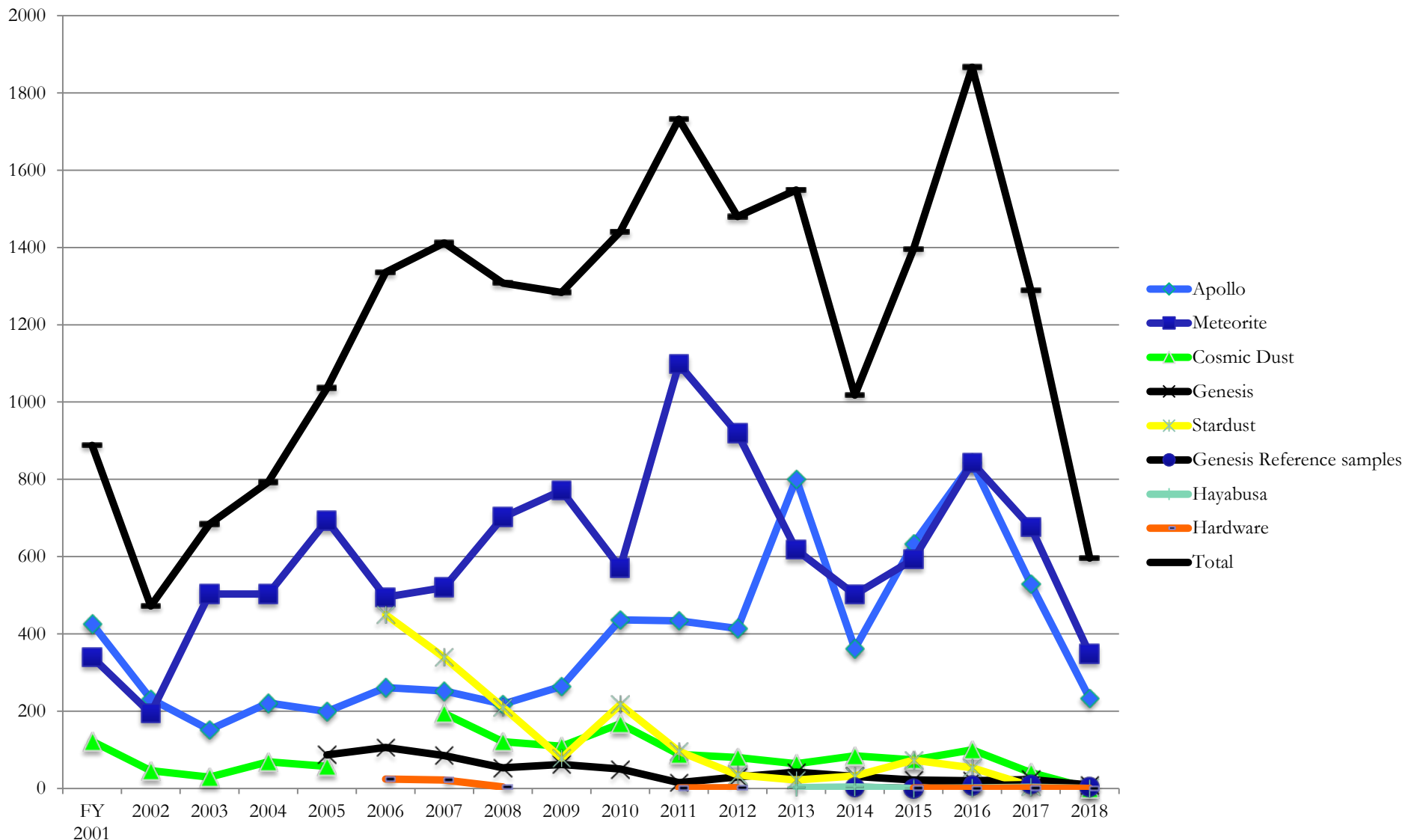
Allocation highlights since November 8, 2017



- 1 Stardust allocation partially worked, 2 keystones allocated
- 9 Genesis flown samples and 4 non-flight reference samples were allocated
- 233 Apollo samples allocated
- 361 Apollo samples have been returned
- 348 meteorite samples allocated to 51 PI's
- Total of 234 new meteorites announced in Spring 2018 newsletter
- We received 263 samples from 2017-18 ANSMET season earlier this week!
- No Hayabusa, Cosmic Dust, or MIC samples have been allocated since the previous CAPTEM Meeting



Astromaterials Allocation Numbers



Status of pending allocations approved in Fall 2017 or earlier



Meteorites

- 5 pending requests, 3 for thick slices, one for extensive sawing/cutting of OCs, and 1 lunar chip awaiting photo-documentation before chip allocation

Apollo

- 12 pending requests, 8 awaiting additional PI requirements or information, 2 awaiting completion of thin sections, and 2 were old pending requests for which we recently received PI input

Stardust

- 2 Stardust allocations are in work.

Cosmic Dust

- 1 request pending results of PI sample inventories.

Genesis

- 1 partial allocation from 2016 pending initial results report from PI

Hayabusa & Space Exposed Hardware

- 0 pending requests

Astromaterials Curation Office – Outreach Highlights



Educational Disk and Outreach programs reach 10,000s

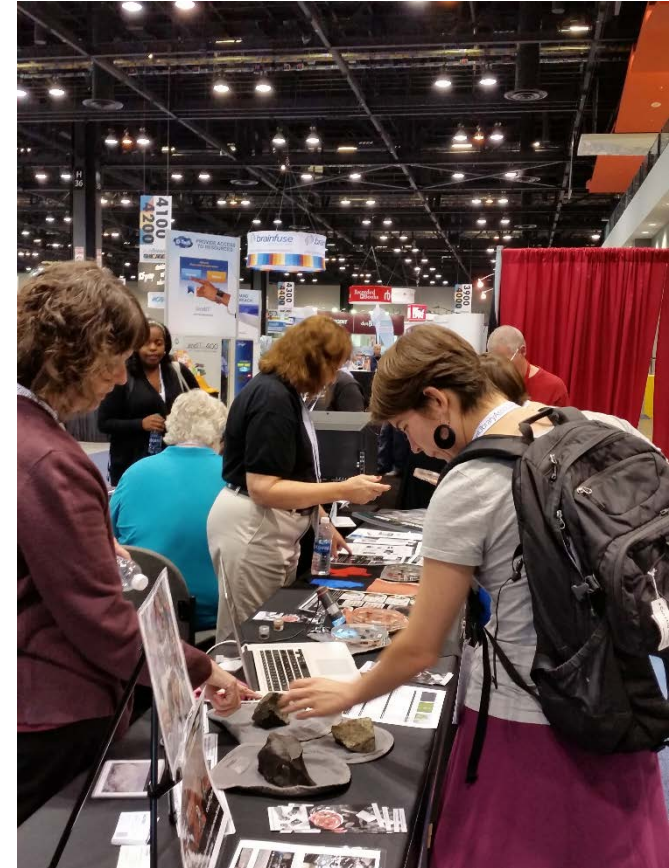
- Total FY17 – 27 Sample Disk Cert workshops
- NASA Science Day Events – 1,383 participants reached
- Short term loans:
 - Since October 2016 – 266 disks (148 lunar/118 meteorite)
 - Since October 2016 – 25 thin section packages (15 lunar/10 meteorite)
 - 89 Lunar & Mars Soil Simulant sample packs to educators, museums, students (47 lunar/42 martian)

• Displays

- 27 public outreach events using displays reached over 4,709 (students, teachers, or public)

• Social Media sites featuring Astromaterials

- Blog: myares.wordpress.com, Facebook (NASA ARES), Twitter, Instagram



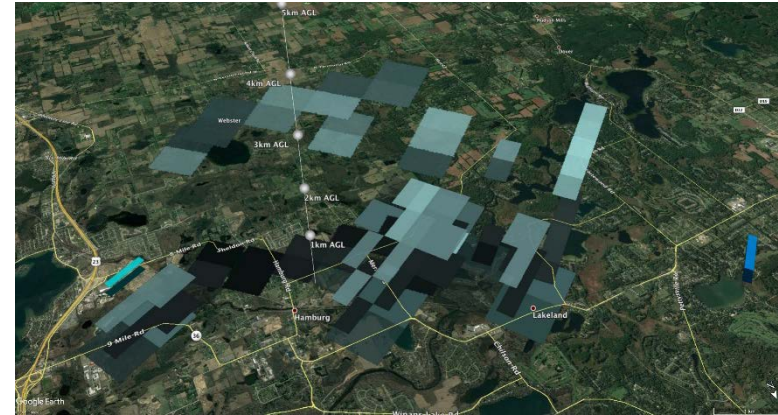
Follow us @ any of our social media sites!



Updates on Advanced Curation



- Hamburg Meteorite Consortium Study
 - The Hamburg, MI (H4) meteorite fall occurred on 17 Jan 2018
 - One meteorite was collected in clean aluminum foil with a bag overwrap and *kept frozen*
 - This meteorite was supplied to Curation
- We will treat the meteorite as a “returned sample” and perform a Preliminary Examination
 - First trial of **Cold Curation** sample processing under purview of Dr. Julie Mitchell
 - Test of the PE process and practice for current Curators, ahead of upcoming sample return missions
 - Thorough Contamination Knowledge (CK) description



Updates on Advanced Curation



- Dry Collection of Cosmic Dust

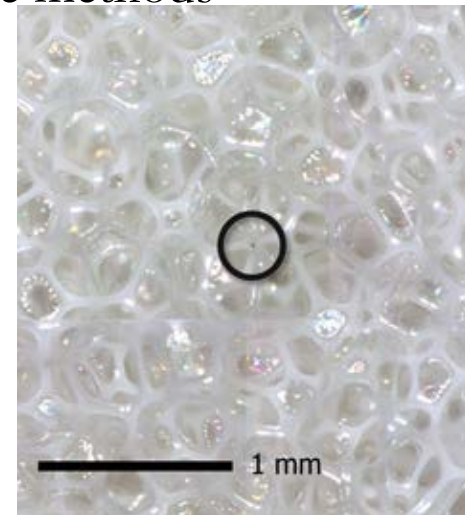
- Previous work (Messenger et al 2015) has demonstrated that interplanetary dust particles (IDPs) can be collected using foam in place of the oil-coated collectors typically used

- Oil is a contaminant that obfuscates studies of organics, O isotopes, etc.

- Collection is proven, but removing the particles is difficult

- CD team and Chris Snead “brainstormed” nine methods to remove particles, narrowed them to six

- Vacuum wand, particles trapped on filter
 - Vacuum glass probe tip for individual particles
 - Adhesive probe using carbon tape
 - Cut the foam, distribute as mounted sample
 - Update existing system with stage articulation
 - Glass needle probe

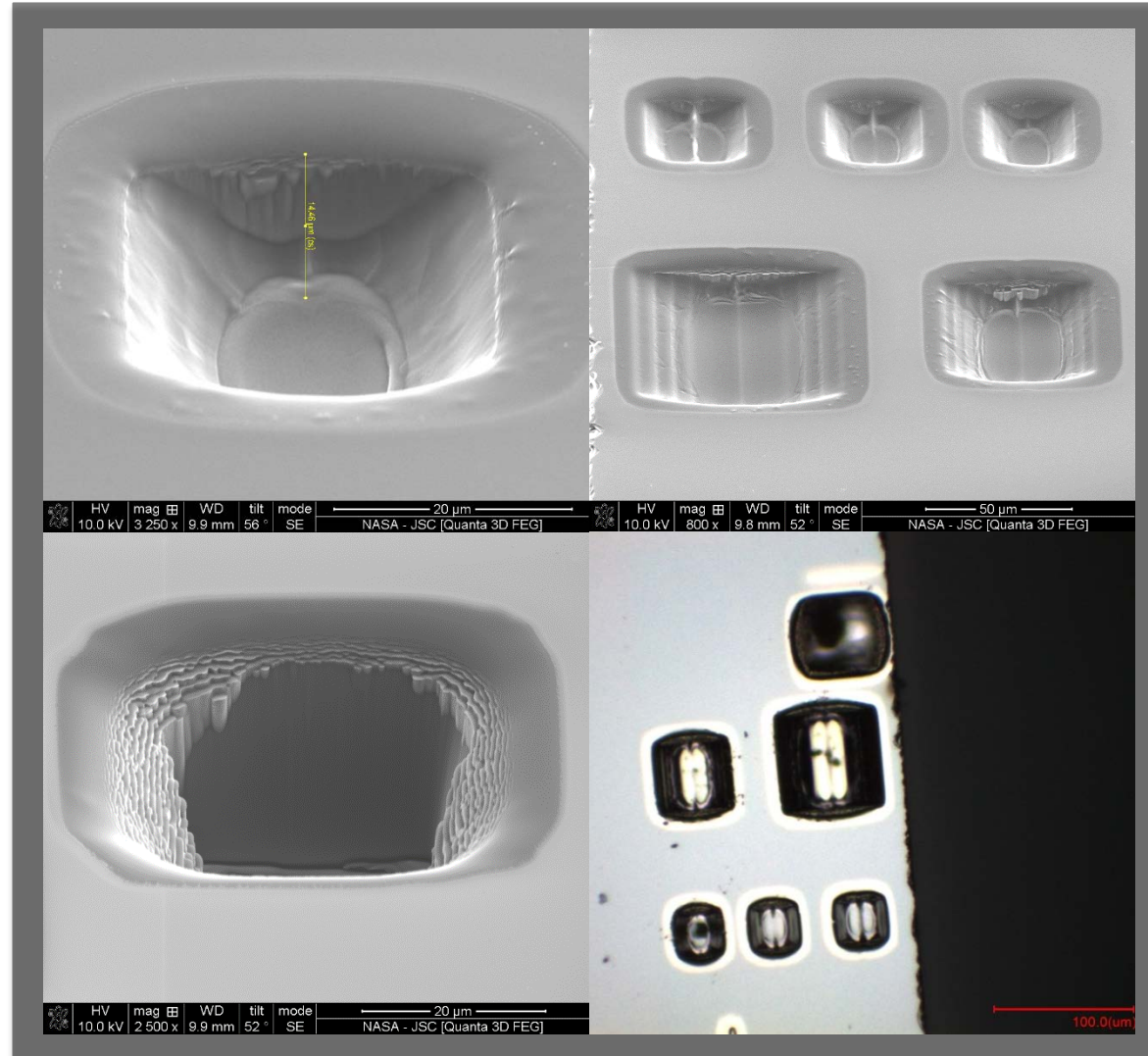


- These six methods will be tested using simulant-spiked foam
- “Winning” methods may be used in combination for different particle types

Updates on Advanced Curation



- We experimented with storing small ($<20\mu\text{m}$) particles in wells that have been produced via FIB by Zia Rahman
- Valuable samples are robustly confined for storage and transportation
- Semiconductive Si storage receptacle reduces triboelectric charging effects and may be suitable for some e-beam analyses and characterization
- Similar wells may be produced on other substrates (e.g. beryllium)



Updates on Advanced Curation



- Comet Surface Sample Return
 - Scoping testing (experiments, modeling, etc.) needed to support future mission(s)
- Cold Meteorite Processing/PE
 - Upgrades to make hardware cold-tolerant ongoing
 - Practice runs with witness materials and positive controls will be conducted prior to sample preparation of Hamburg meteorite
- Long-term Cold Curation Studies
 - Long-term storage testing will begin once materials are collected
 - Samples will be stored at -20 and -80 deg. C for predefined time intervals
 - GC-MS, SEM, and FTIR will be used to assess sample alteration



CO2 "snow" to be used for volatile simulant

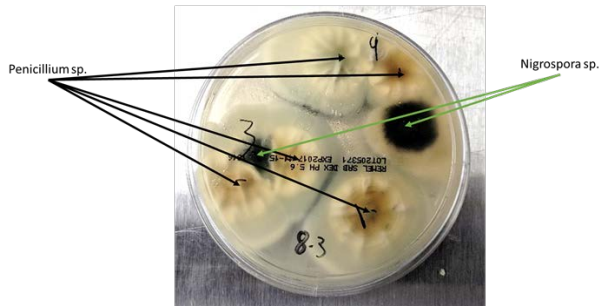


Subset of cold curation development hardware



Updates on Advanced Curation

Saboraud Dextrose



- Amino Acids in Fungal isolates from Meteorite lab
 - Fungal isolates are not producing exotic amino acids

Amino acid abundances in hydrolyzed fungal samples

