Astromaterials Curation Data Initiatives

Astromaterials Acquisition and Curation Office
Astromaterials Research and Exploration Science Division (ARES)
Exploration Integration and Science Directorate
NASA Johnson Space Center
Input developed by Dr. Cynthia Evans and Nancy Todd

NASA's Astromaterials – *Setting the Stage*

Sample science forms a critical base for planetary science and understanding solar system evolution

- NASA's Johnson Space Center curates all of NASA's extraterrestrial samples
  - Responsibility dictated by NPD 7100.10E and derivative documents
- Our charge is to preserve, protect and provide
  - Conserve these samples for current and future scientific research, and maintain their scientific, cultural and political value
  - Accomplished through end-to-end mission support, detailed planning, and controlled archival of astromaterials collections and associated hardware, and associated data.

NASA's Astromaterials Collections

- We curate several different Astromaterials collections:
  - Apollo Lunar Samples
  - Antarctic Meteorite Collection (ANSMET)
  - Cosmic Dust from the Stratosphere
  - Stardust Comet and Interstellar Grains
  - Genesis Solar Wind
  - Hayabusa
- Samples from various bodies in the solar system:
  - Moon (Apollo, meteorites)
  - Mars (meteorites)
  - Asteroids (meteorites, cosmic dust, Hayabusa)
  - Comets (Stardust, cosmic dust)
  - the Sun (Genesis)
  - Interstellar dust streams (Stardust, cosmic dust)

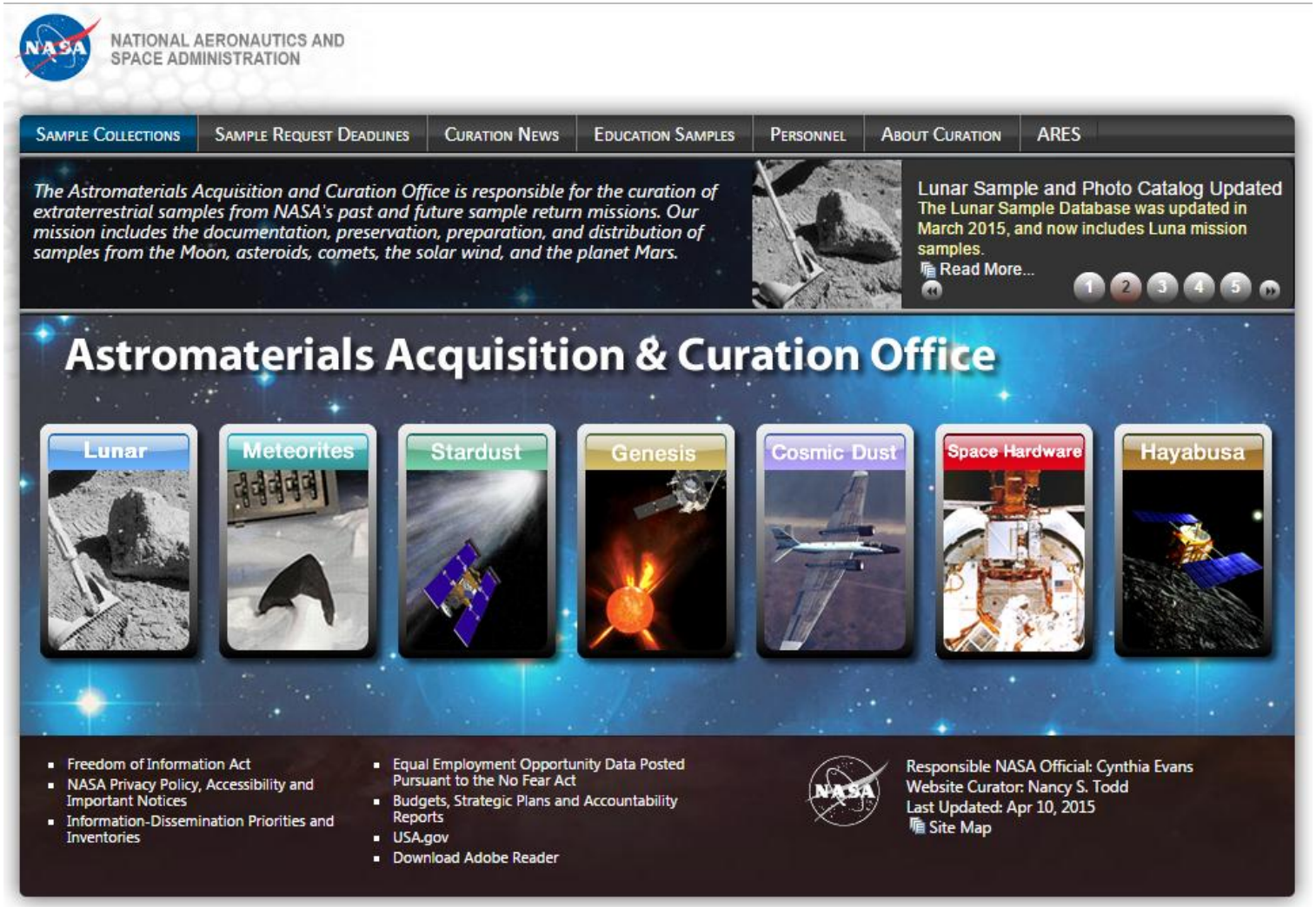
Each collection is unique

- The integrity of the samples from each collection is a result of the early partnership between curation scientists and the mission scientists and engineers

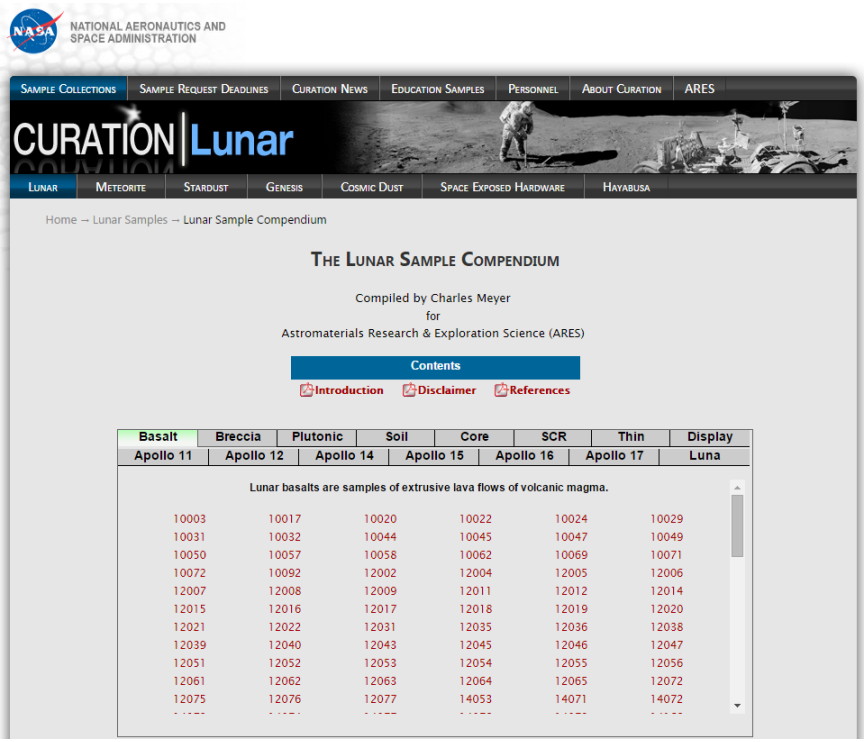
Challenges for Astromaterials Databases

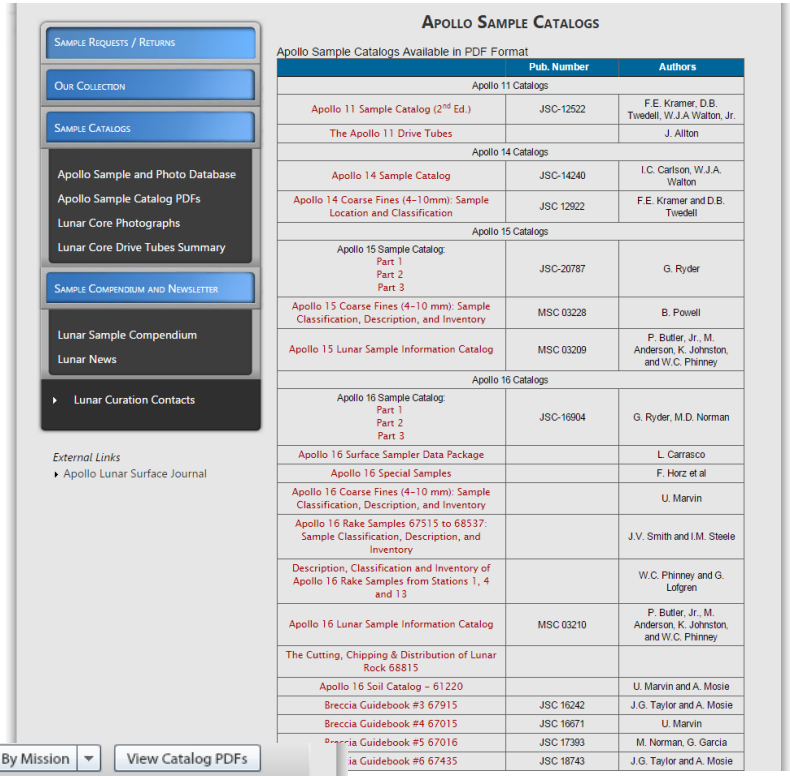
- To support planetary science research on these samples, various data types are managed
  - Descriptive data of the missions for sample and analysis context
  - Descriptive data of the collections for overview of samples available
  - Information about each sample for scientists to determine the right sample for allocation to study
  - Inventory and handling history of each sample
- The Astromaterials Curation Databases
  - Each astromaterials collection developed a unique database with different technical requirements and implementation
    [http://curator.jsc.nasa.gov/]
  - Curate >20TB of sample data
  - The variety of data, the evolving data-recording media over the years (1960s to present), and different database architectures made finding and using data across the individual collections difficult for the scientific community.
- The Astromaterials Acquisition and Curation Office has several informatics initiatives that address these challenges.

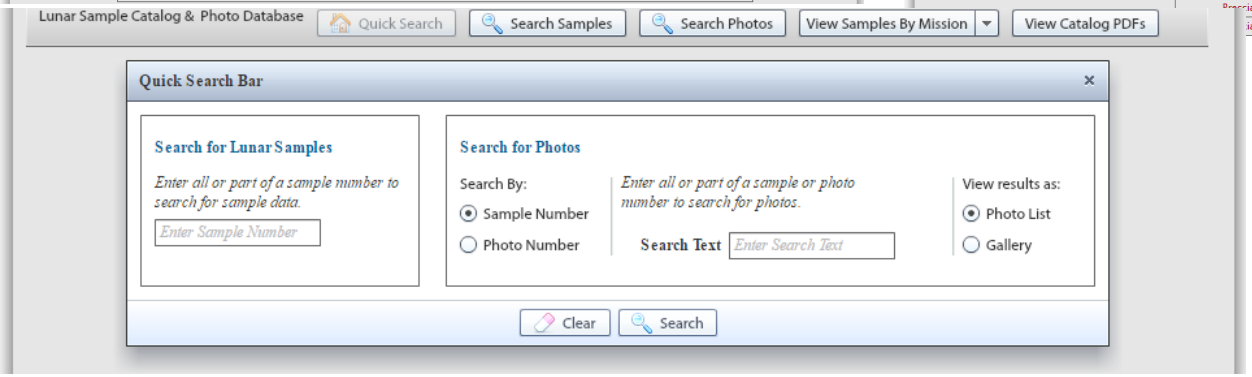
Public Access to Information



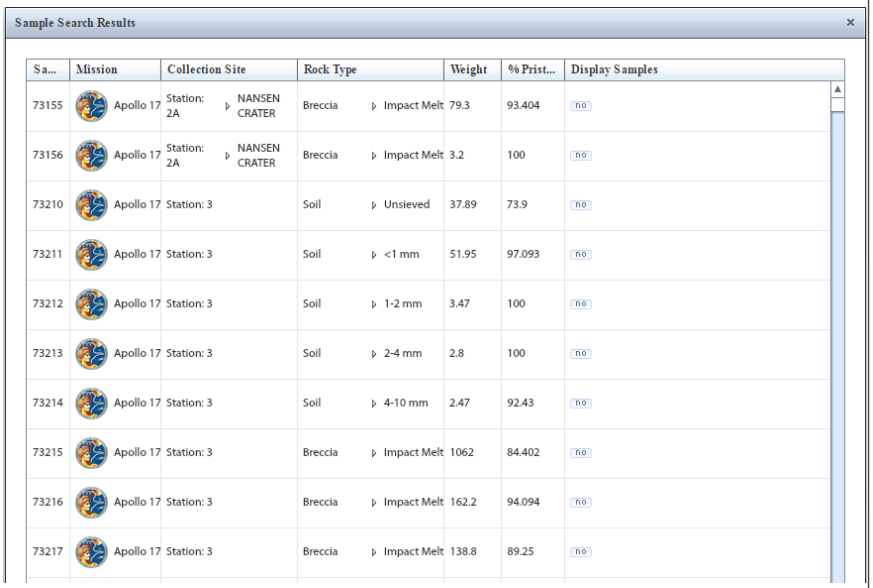
Examples of Data Access

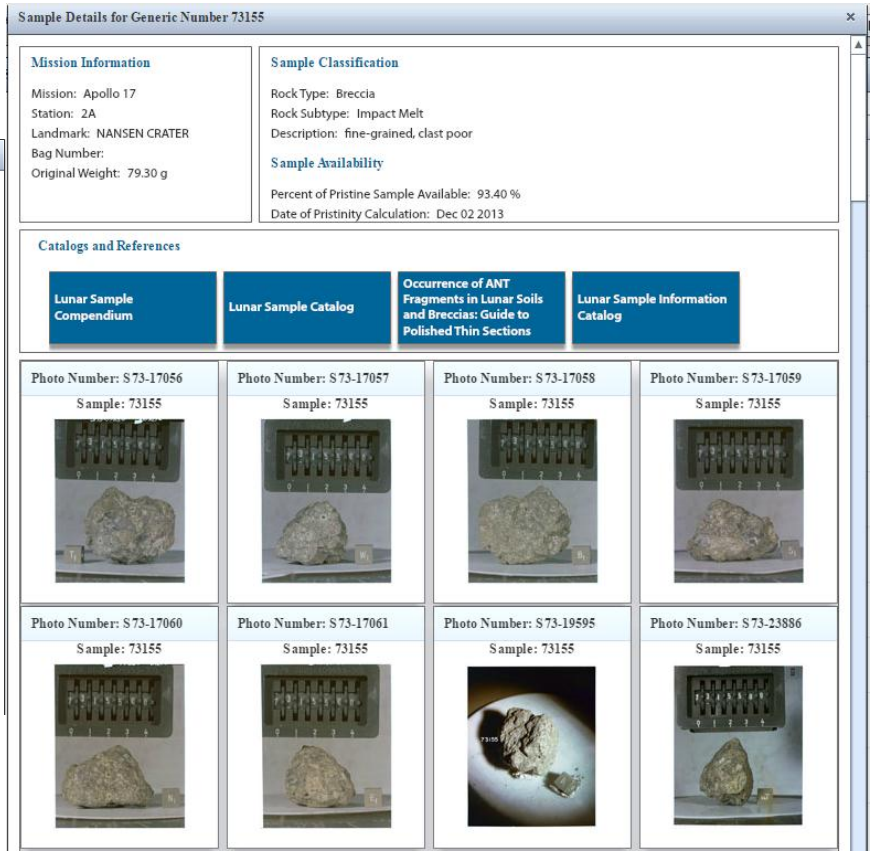






Examples of Data Access





Curation Database/Informatics Initiatives (1)

- Common architecture for each Astromaterials Collection Database
  - The Astromaterials Curation Digital Repository [http://curator.jsc.nasa.gov/]
    - documentation about the samples and their history
      - sample processing data and images
      - preliminary characterization data
      - JSC handling and storage
      - allocation activities
  - Astromaterials Sample Tracking and Reporting Application (ASTRA) Framework
    - consolidate common functionality into a services library that manages access to data and standardizes the implementation of common processes for all collections

Curation Database/Informatics Initiatives (2)

- Upgrade and add digital compendia
  - Highlight published findings on designated sets of samples such as Lunar meteorites, Martian meteorites, Lunar sample suites
- Scanning and hosting high resolution imagery of samples from historic media
  - Completing a project with PDS Imaging Node to scan and digitally archive all Apollo sample film-based images at high resolution
  - >36,000 photos of samples, including top, bottom, sides, subdivisions, stereo pairs

Curation Database/Informatics Initiatives (3)

- Scanning and hosting additional non-digital data about samples from historic media
  - A variety of images (many formats), data packs, associated mission data that are stored as hard copy in Astromaterials Curation Data Center
- Creating mechanisms for new data, new media, new links and data synthesis tools
  - 3D imagery generated from detailed optical imaging and Micro-CT imagery
  - MoonDB, Data restoration of at-risk lunar data sets through PI involvement
    - PDS4 compliant archive
    - Model based on geochemical data through IEDA/EarthChem and PetDB
    - Includes data synthesis tools used in IEDA databases

Summary – Astromaterials Curation and PDS

- Sample data and planetary remote sensing data are complementary (enhanced scientific understanding when linked)
- Astromaterials Data are
  - Accessible by the public
  - Part of daily Curation operations
  - Archived for security and scientific integrity
  - Actively working towards PDS compatibility when applicable
    - Ongoing dialog with PDS about additional connections between PDS and Astromaterials Curation Sample Databases