Improving the Discoverability and Availability of Sample Data and Imagery in NASA's Astromaterials Curation Digital Repository Using a New Common Architecture for Sample Databases.
N. S. Todd[1] and C. Evans[2], [1]UTC Aerospace Systems/JETS Contract, NASA Johnson Space Center, Mail Code XI2, Houston, TX 77058 (email: nancy.s.todd@nasa.gov), [2]NASA Astromaterials Curation Office, NASA Johnson Space Center, Mail Code XI2, Houston, TX 77058.

Introduction: The Astromaterials Acquisition and Curation Office at NASA's Johnson Space Center (JSC) is the designated facility for curating all of NASA's extraterrestrial samples. The suite of collections includes the lunar samples from the Apollo missions, cosmic dust particles falling into the Earth's atmosphere, meteorites collected in Antarctica, comet and interstellar dust particles from the Stardust mission, asteroid particles from the Japanese Hayabusa mission, and solar wind atoms collected during the Genesis mission.

To support planetary science research on these samples, NASA's Astromaterials Curation Office hosts the Astromaterials Curation Digital Repository [http://curator.jsc.nasa.gov/], which provides descriptions of the missions and collections, and critical information about each individual sample.

Our office is implementing several informatics initiatives with the goal of better serving the planetary research community. One of these initiatives aims to increase the availability and discoverability of sample data and images through the use of a newly designed common architecture for Astromaterials Curation databases.

NASA's Astromaterials Curation Databases: The Astromaterials Curation Databases contain vital information about NASA's astromaterials collections. Data in these databases include complete documentation about the samples and their history including sample processing data and images, preliminary characterization data, JSC handling and storage, and allocation activities. These data holdings are continually updated with new samples, photos, and related documentation.

Limitations of existing databases. Despite the wealth of information collected in the databases, there were many obstacles to making these data available to the scientific community in a highly discoverable fashion. Each collection had its own separate database with its own technical implementation, which vastly differed between collections. This made it very difficult to find and present data as interaction between databases was problematic and data was often inconsistent between collections.

To address this problem and enhance searchability and access to the data, a multi-year effort was launched to pull individual collection databases into a common architecture and provide common functions to the PI community and the curatorial staff.

The Astromaterials Sample Tracking and Reporting Application (ASTRA) Framework: The newly designed common framework consolidates all common functionality into a services library that manages the access to data and standardizes the implementation of common processes for all collections. The following table shows the features and benefits of this application framework.

ASTRA Framework Features and Benefits

FEATURE	FUNCTION	BENEFITS
COMMON FRAMEWORK LIBRARY	Provides centralized common services that standardize the implementation of common processes in Curation. Provides notification services for key parts of the request and allocation process.	1. Simplified sample tracking operations. 2. Improved communication of status to Curators and PIs. 3. Improved high-level reporting. 4. Reduced rework on new collection database apps.
INDEPENDENT SERVICE MODULES TO ACCESS DATA	Encapsulates all data-related functionality independent from the user interface. Implemented with ColdFusion Server, a mature and stable application server that is well supported and updated frequently.	1. Data can be accessed and manipulated through a variety of user interfaces without affecting the data management logic. 2. Isolates the process logic and data access from frequently changing user interface technologies.

INDEPENDENT USER INTERFACES	Provides user access to all the functions needed to perform their jobs. Can be customized for each collection independently or use common custom components. Implemented using Adobe Flex, which can produce output in Flash, HTML5, JavaScript, and native iOS.	1. Isolates user interface from data services so it can access data using a variety of methods. 2. Can be changed more frequently without affecting the application logic and data access. 3. Uses a common code base that can generate content optimized for different platforms and environments.
ADMIN APPLICATION	Centralizes access to all common functionality from one location. Houses Curatorial Order administration, Tours management, Mail management, and User security management.	1.Provides single point of access to Curation applications. 2.Provides app administration functions to delegate app and user management responsibilities outside of IT department.
CENTRALIZED DATABASE FOR ALL CURATION COLLECTIONS	Maintains all sample data collected during the Curation process. Implemented using Microsoft SQL 2008 R2. Proposed upgrade to SQL 2012 Enterprise Server.	1. Ensures consistency and accuracy of data across all collections. 2. Easier to create audit and management reports that aggregate data from all collections. 3. Upgrade to Enterprise edition will allow real-time monitoring of server and a complete auditing solution that tracks every
		change to the data to ensure data integrity.
DOCUMENT AND PHOTO MANAGEMENT	Allows users to upload documents and photos and associate them to a specific sample, request, pi, allocation, or curatorial order.	1. Improve access to all data associated to a sample, request, or allocation. 2. Allow automatic generation of sample catalogs for the Curation website, reducing the time between updates.
LIVECYCLE ES4 SERVER WITH ADOBE EXPERIENCE MANAGER (AEM)	Document and forms platform used to capture and process information, generate custom communications, manage workflows, manage authoring and publishing of data	1. LiveCycle is a scalable, unified platform that captures and processes information, delivers personalized communications, and secures and tracks sensitive data to reduce paperwork, accelerate decision-making, and ensure regulatory compliance.

Other Initiatives: In addition to the redesign of the Astromaterials Curation databases, we are also engaging in several other informatics initiatives that will help us improve the quality and accessibility of data in our digital repository. We continue to upgrade and host digital compendia that summarize and highlight published findings on the samples (e.g., lunar samples, meteorites from Mars). We host high resolution imagery of samples, including newly scanned images of historical prints from the Apollo missions. Finally we are creating plans to collect and provide new data, including 3D imagery, point cloud data, micro CT data, and external links to other data sets on selected samples.

Together, these individual efforts will provide unprecedented digital access to NASA's Astromaterials, enabling preservation of the samples through more specific and targeted requests, and supporting new planetary science research and collaborations on the samples.