**OSIRIS-REX SAMPLE ANALYSIS MICRO-INFORMATION SYSTEM: 2D SPATIAL REGISTRATION AND VISUALIZATION OF MICROSCOPIC DATA.** M. M. Westermann[1], C. A. Bennett[1], H. C. Connolly, Jr.[1,2], K. Domanik[1], A. Ferro[1], M. Fitzgibbon[1], P. Haenecour[1], D. Hammond[1], E. McDonough[1], L. Smith[1], D. S. Lauretta[1], [1]Lunar and Planetary Laboratory, The University of Arizona, 1629 E. University Blvd., Tucson, AZ 85721-0092 (mmwest@orex.lpl.arizona.edu). [2]Department of Geology, Rowan University, Glassboro, NJ 08028.

**Introduction:** Beginning in September 2023, the OSIRIS-REx mission will have 2 years of exclusive access to the sample returned from asteroid (101955) Bennu [1]. During this time, measurements of the returned sample must be coordinated using an approach that involves close to 50 analytical techniques applied in dozens of laboratories across the world. Curation will be handled by NASA's Johnson Space Center (JSC).

The Sample Analysis Micro Information System (SAMIS) is a comprehensive data management system being built at the University of Arizona to streamline sample tracking and data processing [4]. A unique component of SAMIS is the use of geographic information system (GIS) tools and techniques to automate 2D spatial data registration and visualization of datasets produced by the JSC curation facility and mission scientists.

**Using and Adapting GIS:** Leveraging traditional GIS, SAMIS data is housed in a Postgres database with PostGIS extension enabled, providing access to hundreds of built-in spatial functions and operations. The database connects to commercial online data visualization software from Environmental Systems Research Institute (ESRI). SAMIS processes spatial data into industry-standard formats, such as shapefiles and rasters with spatial auxiliary files, effectively making SAMIS data compatible with GIS tools.

SAMIS also includes customizations that adapt traditional GIS to the microscopic level. A valuable adaptation is how samples will be processed during preliminary examination at JSC such that SAMIS can treat each sample mount (e.g., thin section) as its own map and coordinate system. Ahead of sample distribution, each sample mount will have fiducial markers (both macro- and microscopic) strategically and permanently etched onto it [2]. These fiducials ensure consistent sample orientation in the instruments and are also used as tie-points in the automated spatial registration process. The overview images submitted to SAMIS of each mount become the basis for defining that mount's coordinate system and serve as basemap imagery in the visualization tool.

**Automated Spatial Data Registration:** When analytical data are submitted to SAMIS, they are automatically registered to the sample mount's basemap. Automatic spatial data registration transpires in two main steps: 1) registration in the instrument coordinate frame, and 2) transformation from the instrument to the basemap coordinate frame. Registration in the instrument coordinate frame uses the spatial data and coordinate systems that are built in to a given instrument and only requires scaling and shifting pixel coordinates. Transformation to the basemap coordinate frame uses tie-point pixel locations in both the basemap coordinate frame and the instrument coordinate frame as inputs in a 1st Order Polynomial (Affine) Transformation to complete registration [3].

**Spatial Data Visualization:** Spatially registered data in SAMIS are automatically viewable in ESRI's ArcGIS online Map Tool, accessible through SAMIS's desktop application [4]. The Map Tool includes a user-friendly data gallery that allows users to query and pull up a complete set of spatially registered data for a given sample. The Map Tool includes basic capabilities such as data layering, zooming/panning, measuring, and coordinate location, as well as advanced operations to alter data or perform further analysis. Tables and graphs are also viewable through the Map Tool, making it easy to investigate a sample with full context and generate custom maps and graphics for presentations and papers.

**Conclusion:** SAMIS uses tools and techniques that are well established in traditional GIS but novel in the field of microscopy. Marrying the two fields will result in unprecedented access to comprehensive microscopy datasets acquired across a large, distributed team. By combining custom components with industry standards, SAMIS will bridge the gap between the limited opportunity OSIRIS-REx has to analyze the sample of Bennu and long-term data accessibility outside of the SAMIS environment.

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