

Overview of the Digitization Workflow Post Image Acquisition of Apollo Lunar and Antarctic Meteorite Samples using Agisoft Photoscan for the NASA 3D Astromaterials Virtual Samples Collection

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The 3D Virtual Astromaterials Samples (3DVAS) collection is a multi-year funded project to create a digital database of sixty Apollo Lunar and Antarctic Meteorite samples following non-destructive documentation conservation protocols. After initial image processing, the photos are evaluated and processed using unique structure-from-motion photogrammetric techniques in a high performance modelling software designed to create a 3D model from 2D images: Agisoft Photoscan Pro.

[Agisoft Photoscan Pro](#) uses image processing algorithms and techniques originating in computer vision to resolve 3D models for accurate and detailed visualization of a subject. The software provides a stepwise process that is tailored per model based on spatial and specular reflectance properties, for example. The process includes: photo alignment, creation of a dense point cloud, mesh, and finally texture. Photo alignment is dependent on model properties. The 3DVAS process requires a special rotation platform with calibrated photogrammetric targets, specific distance rotation protocols, and a contrasting background for alignment and scale accuracy. As a result of the photographic process, alignment will complete with two mirrored hemispheres that, in a sense, represent the 2D images overlapping to create a 3D model. Each dense point cloud is analyzed with provided statistical measures in a gradual selection process to eliminate outliers. The point cloud is reduced to include only data valuable to the final model. When a precise dense point cloud is achieved, a mesh and texture are applied. Each model is scaled with scale bar accuracies within 100 microns.

Each sample has its own intimate process for modelling; there is no standard for the parameters required in the final creation of a high resolution model. By processing multiple samples, a skill is gained in practice to allow a close definition of the original sample and will result in the most detailed version of the sample shell.

This process completes one-fifth of the 3DVAS protocol for providing accurate digital documentation. Each model shell is merged with X-ray Computed Tomography data to create a full volumetric sample. All 3DVAS data will be served on [NASA's Astromaterials Acquisition and Curation website](#) with an early subset of data available in 2019 and the 3D Virtual Astromaterials Samples Collection launch in 2020.