ENGAGING LEARNERS WITH NASA'S ANTARCTIC METEORITES AND APOLLO MOON ROCKS

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Introduction: A primary goal of our Astromaterials Research and Exploration Science (ARES) Science Engagement team at NASA's Johnson Space Center (JSC) has been to engage students, educators, the science community, and the public with NASA's Astromaterials assets including Astromaterials samples, specialized facilities, and Subject Matter Experts (SMEs). Our team has facilitated this through in-person events, hands-on activities, and virtual connections with educator and student (grades 3-12+) audiences. During COVID, our team initiated an effort, focusing on NASA's Antarctic Meteorite and Apollo Lunar Collections, to reimagine existing resources and content to facilitate access to these assets whether an educator or SME is connecting with audiences virtually or in-person, or ultimately when a learner is exploring on their own. These collections provide rich scientific data for the science community but they can also be used to help inspire the public, including the next generation of scientists.

Targeted Content and Resources: In looking at existing content and resources focusing on Antarctic Meteorite and Apollo Lunar Collections, we targeted three areas of emphasis: background and context; virtual tours of the curation facilities; and Astromaterials 3D. For background and context, we wanted to deepen learners' understanding of where and how these assets were collected, how they are classified, and what those classifications reveal about the individual sample and solar system history. Virtual tours are possible to facilitate from the laboratories, however they require extensive coordination and involve connectivity challenges. Our team wanted to provide access to these labs with fewer challenges and showcase aspects that may not be readily available during a typical tour. With Astromaterials 3D, a virtual library of Antarctic Meteorites and Apollo Lunar samples, led by Transdisciplinary Artist Erika Blumenfeld and an interdisciplinary team of experts, this online tool is for scientific research and the curious public. This resource provides a wealth of information with exterior and interior views of samples and curated pins highlighting features, but may be challenging for a learner with a limited background to digest.

Reimagining Resources: Our team's goal was to reimagine how to package content in order to provide learners of varying ages and levels of expertise with a variety of ways to build and enhance their knowledge and skills and provide multiple launch points from which to continue exploring on their own. These reimagined resources are being designed to be adaptable by educators and SMEs who may connect with in-person or virtual audiences or by individuals exploring on their own. "Classifying Moon Rocks" is an online interactive that provides background about the Moon, the Apollo Missions and samples collected, as well as background and visible characteristics to look for when classifying Moon rocks. Learners explore samples by clicking and dragging to rotate the Moon rock in 3D in order to determine the classification based on observable characteristics. The interactive connects users to Astromaterials 3D, actively encouraging them to continue exploring lunar samples building on the knowledge and experience gained. "Classifying Meteorites", currently under development, is being designed in a similar way, aiming to build background knowledge and context about NASA's Antarctic Meteorite Collection. Additional online interactives and hands-on activities, such as our new Meteorite Discovery Board activity, will be developed to continue providing opportunities to deepen the knowledge of learners with launch points directing learners to Astromaterials 3D for continued exploration, aiming to build confidence and skills in using tools also used by SMEs. These reimagined resources also aim to highlight experts involved in this work and the laboratories where samples are curated. To facilitate access to the Antarctic Meteorite Lab at JSC, we have developed a prototype virtual tour. We have tested the prototype tour by having a SME share a tour of the lab without physically being in the lab. This removes challenges involved with connecting with a remote audience from the lab and enables sharing aspects of the lab that a visitor would not otherwise be able to experience. This includes showing the bandsaw while in use, or giving learners an enhanced view of a sample that can be further studied using Astromaterials 3D. By incorporating the exploration of meteorites using Astromaterials 3D as part of the virtual tour, it helps learners gain insight into how to explore other samples on their own, building awareness and confidence in using the tools available. Our team will develop and test a similar virtual tour of the Apollo Lunar Laboratory. Once finalized, these tours, along with other developed resources, will be available online enabling learners worldwide to have the opportunity to deepen their understanding of these collections, increasing excitement about science and exploration and fostering confidence to continue their journey of discovery.

Conclusions: By reimagining resources focusing on NASA's Antarctic Meteorite and Apollo Lunar Collections, we can provide access and opportunities to deepen knowledge and build skills that encourage learners of varying levels of expertise to engage with these collections, and in doing so, help inspire the next generation of scientists.

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