Inspiring the Next Generation of ISRU Researchers. S. Rodriguez[1], A. Madison[1], Z. Landsman[1], J. Long-Fox[1], A. Metke[1], A. Glover[1], A. Dovali[1], K. Krol[1], P. Easter[1], D. Britt[1], [1]Exolith Lab, University of Central Florida, 532 South Econ Circle, Suite 100 Oviedo, FL 32765-4308; email: exolithlab@ucf.edu

Introduction: When humanity returns to the Moon with the Artemis program, the plan will be to return sustainably. Researchers around the world are working to develop processes and equipment to allow for a continual human presence on the lunar surface. The excitement to return to the Moon has been building since NASA announced the Artemis Accords. In order to go back to the Moon sustainably, we need to inspire the next generation to join us in our mission. As NASA prepares for the next generation of space explorers to return to the Moon, the Center for Lunar and Asteroid Surface Science (CLASS) Exolith Lab aims to educate and inspire today's youth through educational products and outreach experiences in order to garner enthusiasm for the future of human presence on other planetary bodies. Located in Orlando, Florida, Exolith Lab is a non-profit organization at the University of Central Florida. Exolith Lab enables space exploration, engineering, science, and education by making high-fidelity Lunar, Martian, and asteroid regolith simulants available to researchers and students around the globe. In addition to regolith production, Exolith is working to make *in situ* resource utilization (ISRU) research affordable and sustainable.

Products: The development and production of regolith simulants and its own ISRU research are central to the identity of Exolith Lab. However, Exolith Lab also develops and distributes educational products and ISRU-themed artwork to entice the future generation of explorers.

Regolith simulant. Regolith is defined as the layer of fragmental rock material that covers bedrock [1]. Figure 1. shows a bag of finished regolith simulant developed and produced by Exolith Lab [2].

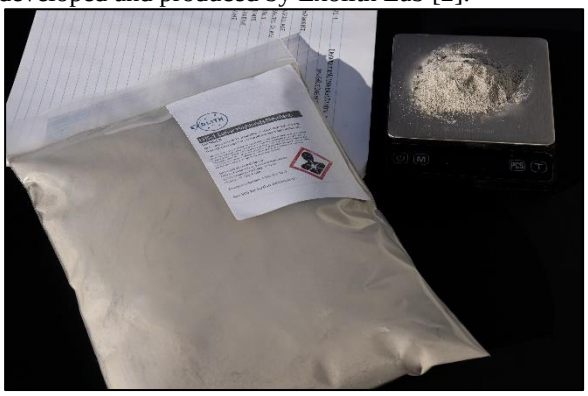

Figure 1. Bagged LHS-1 Lunar Highlands Simulant [2].

Producing physical analogs of extraterrestrial regolith is important because it allows researchers and scientists on Earth to study and experiment with regolith without having to use the extremely limited amounts of extraterrestrial materials in our collections. Studying the surface of other terrestrial bodies allows us to make informed design decisions regarding sustainable extraterrestrial living solutions such as structures, vehicles, agricultural methods, and more. Regolith simulant is the perfect starting point for students to gain hands-on experience and become interested in the ISRU industry because it is accessible and it's easy to understand how it's manufactured.

Regolith Simulant also provides possibilities to get students interested in more complex planetary science topics.

Educational Simulant Kits. Exolith Lab has developed multiple types of educational simulant kits to help give K-12 students hands-on experience with planetary science. Exolith Lab produces and distributes lunar and Martian plant growth kits for the Plant the Moon and Plant Mars challenges. These simulant kits contain 5 kg of Exolith MGS-1 Mars Global Simulant or 5 kg of LHS-1 Lunar Highlands Simulant each accompanied by a pH probe. Students receiving these kits compete over the course of semester to try to achieve the best plant growth results for their respective planetary bodies. Exolith Lab has also created simulant jars to be used in classrooms. These jars contain each of our Martian and lunar simulants and provide a hands-on visual for students when learning about regolith on other planets. Figure 2. Shows two of our lunar simulant jars, one of LHS-1 and one of LMS-1.

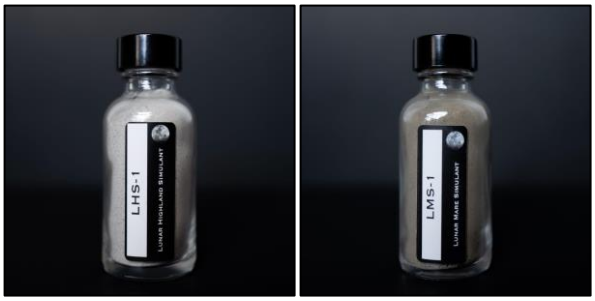

Figure 2. LHS-1 simulant jar (left) and an LMS-1 simulant jar (right).

Posters. In an effort to capture the imagination of our next generation of space explorers, Exolith designed a series of informative and visually appealing posters inspired by NASA's iconic mission posters. So far, we have designed posters depicting a futuristic city colony built via ISRU technology and two engineers harnessing solar power on the surface of the Moon. Additionally, we created informative posters about Mars and Moon research efforts using simple language in order to appeal to those who are not as well versed in space exploration,

including K-12 students. In general, visualizations of extraplanetary life are an excellent vehicle for curiosity and excitement towards space exploration. Figure 3. shows an educational poster developed by Exolith Lab to teach K-12 students about Mars and the Jezero crater, the landing spot of the Perseverance rover. Figure 3. also shows a poster developed by Exolith Lab to inspire students to the possibilities of humanity on another planetary body.

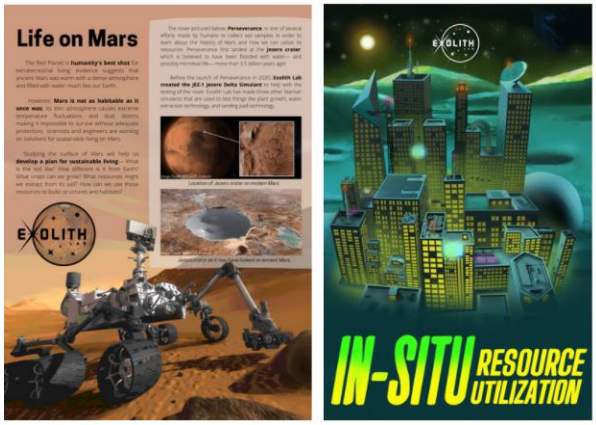

Figure 3. Educational poster developed by Exolith Lab about Mars and the Jezero Crater (left) and an inspiring poster showing a vision of a futuristic city on an unknown planet (right).

Outreach: Exolith Lab teaches and inspires students through multiple different outreach programs: virtual and in-person tours, presentations to classrooms around the US, and volunteering opportunities for high-school students.

Lab Tours. An important part of getting kids excited to join the space exploration cause is to show students what these efforts may look like; by viewing space exploration research up close, students are able to picture themselves working in the planetary sciences. Exolith Lab makes space exploration accessible by having transparent research and manufacturing efforts. Exolith Lab's production facility relocated to a much larger space in mid-2021; with the additional space, it will be easier to safely give tours to much larger groups than ever before. Additionally, due to the COVID-19 pandemic, we were able to accommodate virtual tours via Zoom, allowing us to reach students regardless of their location.

Presentations. Exolith Lab presents to local K-12 classrooms on topics related to ISRU research and space exploration. These presentations provide students with the opportunity to see what goes on in the space industry. We explain what we do at Exolith Lab, our research, and how we develop and produce our simulants. In addition to K-12 presentations, Exolith also presents to college students at their club meetings, capturing the attention of students who are curious about working in the space industry. Due to the pandemic, we now have the ability to do virtual presentations, allowing us to reach classrooms all over the world. Figure 4. shows a virtual presentation about regolith simulants being given to a second-grade class over Zoom by an Exolith Lab employee.

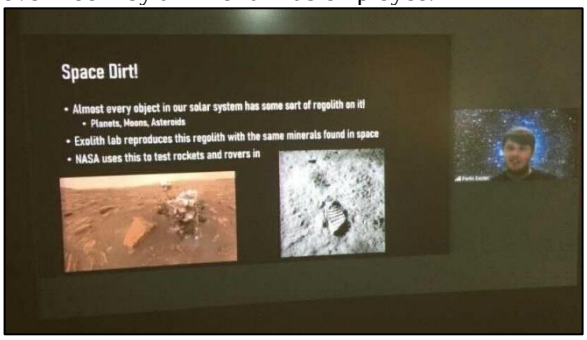

Figure 4. An educational presentation to a second-grade class over Zoom.

Volunteering Opportunities. Another way Exolith Lab is reaching our local youth population is by offering volunteer opportunities to high school students. While they have ample opportunities to learn about the space industry, they also have the chance to learn how to effectively meet goals, and operate as part of a team through the mentorship provided by their colleagues at Exolith Lab.

Conclusion: Exolith Lab is devoted to inspiring the next generation of scientists and engineers through a combination of educational products and outreach experiences to educate kids and give them a chance to participate in our collective effort to explore space.

Future Work: Exolith Lab intends to start an ambassador program, which will enlist members of its personnel to reach out to and mentor K-12 students as they get the chance to learn more about planetary sciences and the possibilities therein. Due to our larger facility, we plan to host entire classrooms at a time for larger tours. We are also working on developing lesson plans for K-12 related to past and future research on the Moon and Mars.

References: [1] Jackson J.A. ed (1997) Glossary of Geology 4th edition. [2] Exolith Lab, LHS-1 Lunar Highlands Simulant product page, November 2021, (2021). https://exolithsimulants.com/collections/regolith-simulants/products/lhs-1-lunar-highlands-simulant. (accessed November 1, 2021).