DEVELOPING AN EVIDENCE-BASED MODEL FOR PREPARING PLANETARY SCIENTISTS TO ENGAGE UNDERSERVED AUDIENCES. A. J. Shaner[1], C. Shupla[1], S. Shebby[2], [1]Lunar and Planetary Institute - USRA, shaner@lpi.usra.edu, [2] McREL International.

Introduction: Planetary exploration is among the "most exciting and accessible" of the science activities funded by NASA or any government agency [1]. However a 2019 National Academies of Sciences, Engineering and Medicine report identified a need for greater inclusion of planetary mission discoveries and planetary subject matter experts (SMEs) within the NASA Science Mission Directorate's Science Activation (SciAct) portfolio [2]. In addition, this report suggested that participating SciAct teams consider "how attending to other aspects of broadening participation like inclusion (as well as supporting equity and attending to accessibility) could expand the number of people who both participate in SciAct and who engage in STEM, generally." Select SciAct teams currently focus on working with girls and with indigenous communities. Planetary ReaCH includes deliberate steps to reach and work with Latinx and Black communities.

The Planetary ReaCH team is composed of planetary scientists and educators from the LPI, the Applied Physics Lab at Johns Hopkins University, the Boys and Girls Clubs of Texas, the Laboratory for Atmospheric and Space Physics (U. Colorado, Boulder), McREL International, Northern Arizona University, and the Planetary Science Institute.

The ReaCH team invites all planetary SMEs to join us as we develop a model for engaging underserved audiences in solar system science and exploration. SMEs will have opportunities to participate in needs assessments, Public Engagement Workshops, and conference seminars, all of which will be discussed in this paper.

The Engagement Model: ReaCH's replicable engagement model will specifically prepare planetary SMEs to engage the SciAct portfolio (including audience-focused disseminators and content producers, such as museums, libraries, Solar System Ambassadors), informal educators who work with Black and Latinx communities, and Black and Latinx community members themselves. As such, the ReaCH engagement model will reflect diversity, equity, inclusion, and accessibility (DEIA) principles.

This model will 1) increase the Science Activation portfolios' capacity to access planetary SMEs and to engage audiences with planetary content, 2) increase the capacity of NASA planetary SMEs to engage audiences, increase SMEs frequency of public engagement, especially with Black and Latinx communities, and 3) increase audience interest and intent to engage with planetary science content.

Workshops: Preparation of SMEs will take place through 3-day Planetary Engagement Workshops (Workshops). Our innovative approach invites SciAct teams and informal educators who serve minority communities to participate in these workshops alongside planetary SMEs. While SMEs provide the planetary science content for the workshops, SciAct teams and informal educators provide their expertise in engaging public audiences. Experts in DEIA principles will also contribute to the Workshops. Workshop activities will explore strategies to reduce barriers and increase relevance to engage Black and Latinx learners, modifications to hands-on activities for different audiences, NASA planetary science priorities and participants' knowledge and experiences, and customizing engagement strategies. Workshops will provide participants the opportunity to collaborate while learning to engage audiences in NASA planetary science. Workshops are planned to be in-person in multiple locations across the country in 2022 through early 2025. If necessary, Workshops can be moved to online platforms in response to the ongoing COVID-19 pandemic.

Workshop locations will be determined based on locations of planetary research and mission facilities, and the locations of underrepresented audiences (Fig. 1). Workshop content and design will be guided by

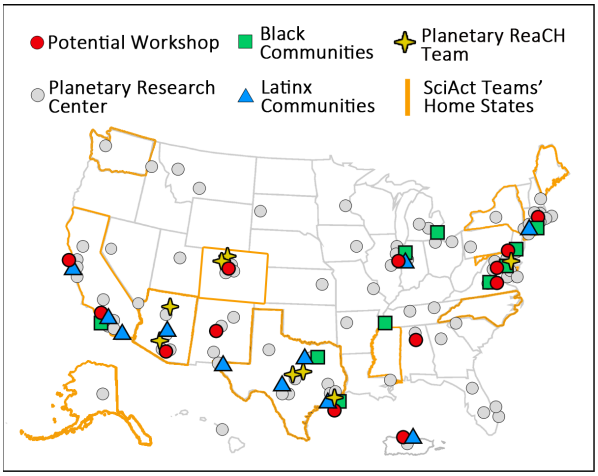

Fig. 1 *Possible locations for Planetary Engagement Workshops (red dots). Locations are near concentrations of planetary research facilities and/or Latinx/Black communities.*

DEIA principles and input from needs assessments conducted in 2021. We will pilot three Workshops in 2022. We will conduct up to six Workshops in 2023 and another six in 2024. We are limited to three Workshops in 2025, in order to complete the evaluation before the end of the grant. Each Workshop will include approximately 15 planetary SMEs, working with up to 15 informal educators. Each Workshop will be externally evaluated to provide feedback for improvement of future workshops and further refinement of the ReaCH engagement model.

Seminars: In addition to 3-day workshops, hour-long seminars will be conducted at the DPS annual conference, the American Geophysical Union (AGU) Fall meeting, the Lunar and Planetary Science Conference, and the annual NASA Exploration Science Forum, sharing best practices for engaging diverse audiences.

Needs Assessments: The Workshop development process will begin with two needs assessments. Their findings will shape all aspects of the Workshops. The first will recruit a broad sample of planetary SMEs from SMD Planetary Science Division missions and projects using communication through mission leads, social media and a snowball approach (where participants recruit other participants). Topics for assessment will include planetary SME's self-reported barriers and challenges to participating in education and engagement activities [3], exploring their baseline knowledge of how people learn and motivations to learn, and their familiarity with enacting educational activities and understanding of DEIA principles. The needs assessment will also explore planetary SME motivations and expectations for disseminating their science and for their professional development. The assessment will include an online survey with follow up interviews of select participants in the first quarter of the project.

A second needs assessment will include informal educators from both the current SciAct portfolio and ReaCH partners who will work with planetary SMEs. This needs assessment will build on the evidence base [4] and internal expertise of how to effectively engage with Black and Latinx communities in culturally appropriate ways and will further inform this project in the most productive ways for planetary SMEs to interact with diverse audiences. This needs assessment will be conducted through individual interviews and focus group interviews in the first quarter of project activities.

Evaluation: The ReaCH team will use continuous improvement processes to systematically examine and improve activities throughout the project lifecycle. Evaluation is not the final phase of implementation, but rather, part of a cycle that helps stakeholders monitor implementation, test and re-test hypotheses expressed in logic models, and make informed mid-course corrections, increasing the likelihood that measures for success and impacts are achieved.

The Planetary ReaCH model is based on the foundation that an evidence-based approach to planetary SME and audience engagement, supported by SciAct partnerships and DEIA-aligned resources, will build SME capacity to engage audiences with planetary science content; increase SciAct and informal educator capacity to access planetary SMEs; and lead to increased interest in planetary science, including among Black and Latinx communities.

The Planetary ReaCH evaluation will include formative and summative components. The formative evaluation will support the timely identification of implementation successes and inform improvements to project activities to ensure measures for success are achieved. The summative evaluation will build on the formative evaluation and will determine the extent to which outcomes and impacts were accomplished.

References: [1] NRC (2011) *Vision and Voyages for Planetary Science in the Decade 2013-2022.* [2] National Academies of Sciences, Engineering, and Medicine (2019) *NASA's Science Activation Program: Achievements and Opportunities*. [3] Buxner et al. (2012) *Connecting People to Science: A National Conference on Science Education and Public Outreach, 457,* 81. [4] Brown J. C. and Crippen K. J. (2016) *Int. J. Sci. Educ.*, *38*(3).

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