

BRINGING PLANETARY SCIENCE MISSION OUTREACH TO THE DEAF AND BLIND COMMUNITIES. C. J. Ahrens¹, ¹NASA Goddard Space Flight Center, Oak Ridge Associated Universities, Greenbelt, MD 20771. (Caitlin.ahrens@nasa.gov).

Introduction: Technology for enhancing outreach, like 3D printing, and science communication products, such as videos and podcasts, can be utilized within the planetary science community, especially for the engagement and excitement of current or upcoming planetary exploration missions. However, these communication products can also be further enhanced for the benefit of the blind and deaf communities. While such products may already be readily available, such projects are not easily accessible to blind and/or deaf certified educators, which often rely on making their own resources or do not have the funds to provide such resources (e.g., cost of 3D printers or cost of braille books). The planetary science community can have better practices to reach these broader audiences. Best practices can include transcripts from podcasts, transcripts in videos, and large-font captions. Images on websites and social media accounts should also include alt-text descriptive captions. 3D printing can also enhance planetary science for the blind community, through tactile posters, maps, and pamphlets. Planetary data can also be augmented by providing different tactile geological maps (e.g., topography or various datasets), and audio-visual videos freely available for educators.

Visual Engagement: Visual engagement consists of several avenues to consider, the three main themes includes: 1) *swag*; 2) *videos*; 3) *interactive exploration*. Swag can include the fun visual take-home materials, such as stickers, posters, bookmarks, etc. Videos can include educational-specific videos (available freely via *YouTube* or by other educational-specific streaming avenues, such as *Nebula* or *Curiosity Stream*), provided they have Closed Captioning (CC). The use of QR codes to such videos or websites can also benefit to being added on swag.

Interactive exploration can also be sub-divided by different types of engagement. A popular and still fairly new technology for public engagement is the use of virtual reality (VR). While this has been mainly for martian and lunar surface exploration [1], the deaf communities can benefit from VR through a more extensive look at our solar system and beyond (for example, a VR experience of the flight path, or visual map of the heliosphere/dynamics of our Sun).

Audio Engagement: Audio tools can also be a useful avenue of communication, especially for the

blind communities. Audio archiving can certainly be transcripts from the video engagements, but also the use of podcasts can also be a benefit. Podcasting can take on two forms: 1) *interview* engagement; and 2) *update* engagement. For interviews, scientists can communicate with STEM-specific podcast platforms to make other listener-bases aware of what is going on with a specific mission. For update-type communication, missions may opt to have an archived podcast of news, updates, and the teams involved. The most important aspect of such podcasts would be for the need of complimentary transcripts (including descriptive transcripts if sounds are included), and the limited use of jargon.

Research Engagement: There have been several examples of involving the blind and low-vision communities in citizen science, such as through the NASA Heliophysics division. Examples include the NASA PUNCH (Polarimeter to Unify the Corona and Heliosphere) mission led by the Southwest Research Institute [2], which include blind and visually-impaired citizens to assist in the Sun's coronal rhythms." Another example is the Eclipse Soundscapes: Citizen Science Project (ES:CSP), which documents observations of acoustical changes of nature and ecosystems during solar eclipse events [3].

Inclusivity: A major theme that is necessary for public engagement is inclusivity and the awareness of reaching broader audiences. Outreach to include hearing/seeing impaired communities are still lacking in the sciences. There are several opportunities that the planetary sciences could take. Other projects that have emerged from the space sciences include adding transcripts to visual engagement [4], and the use of 3D printing for the visually-impaired [5].

References: [1] Olgin, J. (2020) 51st LPSC, Abstract 2137. [2] <https://scitechdaily.com/outreach-for-nasa-punch-mission-embraces-ancient-and-modern-sun-watching-theme/> [3] <https://science.nasa.gov/science-activation-team/eclipse-soundscapes> [4] NASA International Observe the Moon Night (Blind and Deaf Accessible), Youtube Video (<https://www.youtube.com/watch?v=neHCfg0S3-Q>) [5] Richardson, J., et al. (2018) AGU Fall Meeting, Abstract ED23F-0963.