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INDIGENOUS KNOWLEDGE AND SPACE ANALOGS: ETHICAL AND SUSTAINABLE RESEARCH PARTNERSHIPS FOR OFF-EARTH LIVING

Abstract

Across the globe, space analog facilities provide extensive testing platforms for multidisciplinary developments of systems, technologies, and procedures that inform life in space. Beyond increasing a simulation's fidelity, analog facilities and teams seek to reduce the permanent impacts their activities may have on the extreme and diverse ecologies they operate in. This effort protects the long term-scientific fidelity of extraterrestrial-like environments, and also ensures that such activities are just and ethical. Indigenous Knowledge Systems, representing perspectives, experiences, and philosophies of Indigenous People who have held relationships with land and stars across millenia can provide insights that augments the design and operation of simulated and future space habitation. For example, Indigenous Peoples globally have gained generational practice living in isolated confined environments that are often considered "resource limited" in ways that embody sustainability, regeneration, and community cohesion - the same principles critical to space missions. This paper investigates the two-way intersectionalities between the established field of Indigenous Research Methodologies and Methods (IRM2) with space analog research and design approaches. IRM2's frameworks enable research of mutual benefit with Indigenous communities that can make analog research more just, ethical, and environmentally informed. This paper builds off previously established protocols in IRM2 and applies it to analyzing astronaut analog facilities for novel insights to inform an international audience of the why and how of partnering with Indigenous communities. First, a list of prominent NASA, ESA, and other international analog facilities are matched to the Indigenous communities that are the traditional stewards of that respective land, as a tool for all analog-associated researchers and professionals. Furthermore, space analog design principles and practices are then methodically examined using a systems analysis tool with the 8 R's (relationship, reciprocity, respect, responsibility, relevance, representation, resilience, and regeneration), contextualizing them within space analog design. Both the congruences and incongruences of this design approach to current western design philosophies are investigated, such as within notions of sustainability and relationality.Noteworthy socio-cultural dynamics, parallels, as well as two-way academic and economic opportunities are identified through this analysis. A compilation of Indigenous nations associated with analog sites has never been assembled, and results distinctly highlight uninvestigated synergies between the two design approaches. Overall, this review provides insights and opportunities to researchers and designers in the space analogue community that informs ethical and innovative approaches to demonstrating life off-Earth.