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Developing an Anti-Colonial Practice: Moving from Conversation to Structural and Institutional Change within the Space Community

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Abstract

Navigating questions around the future of space exploration will require cross-cultural conversations and a recognition that all peoples and cultures on Earth have a stake in how we engage in being Off-Earth. Currently, Western and Euro-centric systems dominate the way the space community engages in space exploration, technology development, and science in space. In 2021, the Space Enabled Research Group at the MIT Media Lab hosted a series of online webinars and a workshop on Indigenous Anti-Colonial Views on Human Activity in Space to discuss incorporating and centering Indigenous epistemologies and people in the space community and how to resist and replace colonial structures and tendencies. Post seminars and a workshop a central question remains: how do these conversations turn into long-standing relationships that have a concrete impact on decision-making and technical practices related to space? Ultimately, there is tension when engaging in conversations around anti-colonial thought while operating within institutions that are intertwined with the very systems being critiqued. This tension pervades multiple facets of operating within these structures, affecting the conceptualization, planning, facilitation, and reflection of conversations around Indigenous and anti-colonial views on human activity in space. By critically reflecting on the experience of formulating and facilitating the webinar series and workshop, using data collected from a survey of participants after the series, and learning from continued collaborations with Indigenous and anti-colonial scholars, this paper reflects on the presence of tension, and on how to make it a productive starting point for institutional and structural change within the space community.

Keywords: anti-colonial, Indigenous, space exploration

1. Introduction

Space exploration continues to utilize the language and actions of colonialism, more specifically settler colonialism. Words beget actions that create real harm and inflict violence upon Indigenous people and their ways of life, while reinforcing systems that hurt all people and their relationship with Outer Space.

Scholars, scientists, engineers, astronomers, and beyond are becoming increasingly aware of the tension that permeates discussions on resisting colonialism in space exploration [1]. These community members, of all walks of life, approach this tension and develop ways forward in unique ways of varying radicality. There are semantic, methodological, and ethical questions to how to go about space exploration in ways that do not reinforce racist, sexist, colonial, and heteronormative systems of power and damage. The reasonings of why these questions and discussions are needed are obvious to some. Less obvious are the methods of going about work that is truly anticolonial and Indigenous in an environment that is not yet structured for it. The planned NASA Artemis missions and the increasingly aggressive approaches of commercial space actors have also created a sense of urgency to these questions. How do we as members of a space community, as relatives to all beings of Earth, start to answer these questions and fast?

As an attempt to begin to address these questions, the Space Enabled Research Group at the MIT Media Lab put on a series of webinars on Indigenous & Anti-Colonial Views on Human Activity. The webinar series gathered a group of Indigenous scholars, concerned members of the space community, and space exploration ethicists throughout three sessions and an open online gathering. The three webinars were formatted as a facilitated discussion with invited speakers followed by an audience Q&A. Webinar 1 was titled *Framework for Anticolonialism in Space*, Webinar 2 covered *Lunar Exploration and Near-Term Issues*, and the final webinar centered on *Mars and Beyond*. Rather than formulate concrete solutions in the time constraints of the webinars, speakers and audience members came to acknowledge questions that connect to complex decisions that will be made. A further in-depth discussion of the content and pre-planning of the webinar series can be found in the authors' previous paper, *Centering Indigenous Voices and Resisting Colonialism in Space Exploration: An Overview of the*

Ongoing Webinar Series by Space Enabled [2]. Rather than discuss the content outcome of the webinar series, this paper aims to reflect on how to create and sustain a space for these types of webinars, discussions, and gatherings.

This paper is not a broad *how-to* in developing anti-colonial practices or relationship building methods with Indigenous scholars and knowledge holders. This is a narrative-driven and experiential-based critique and discussion of the authors' methodology, methods, and reflective experiences attending to such practices through a webinar series. Additional qualitative data from the webinar audience reflecting on their experiences add a dimension to this analysis. We begin with the authors' reflections on creating and facilitating the webinar series, with initial grounding in statements of positionality. Following the authors' reflections is a discussion of collected audience experiences and their alignment with the authors' experiences. Sharing and reflection of these experiences provides a foundation for a conclusive discussion of moving towards anticolonial action in the space community.

2. Author's Reflections
The authors have included some reflections attributed to us as individuals in response to a series of questions. This is to serve as a starting point for the discussion of both our reflections and feedback from participants that appears later in this paper, and to allow each of us to express our personal experiences as organizers on this project.

2.1 What is your positionality, background, and interest related to anti-colonial work in space?
Alvin D. Harvey: Shí éí Alvin Harvey yinishyé. Tó baazhni'ázhi Nishłį́. Honágháahnii Bashishchiin. Biligana dashicheii. Kiyaa'áanii dashinalí. I am Diné of the Two Who Came To the Water Clan and born for the One Walks Around Clan. My maternal grandfather is white, and my paternal grandfather is of the Towering House Clan. I am from the Navajo Nation, and currently reside in Cambridge, MA while completing my PhD in Aeronautics and Astronautics at MIT. My work and development as a Diné man and an engineer centers on relationality as a core structure of developing partnerships, engineered systems, and good ways of being. This work and research grounded in Indigenous Research Methodologies and Methods is woven into aspects of STEAM education from K-12 to graduate level, systems engineering, and Peace-making. The thinking, planning, living, and reflecting Diné process of restoring and maintaining Hózhó, balance and beauty with the world, drives my reflexivity on this webinar series. It was because of the speakers, particularly the

Indigenous speakers, I am motivated to understand who I am as an Indigenous person. Reflexivity, critical and compassionate, is a core component of Indigenous Research Methodology and Methods and a pillar of Diné philosophy. The questions of if and why we should mine the Moon, create "colonies" in space, pollute the night sky, and build facilities on sacred lands does directly impact me as a Diné individual. As part of my peoples' relationality structure, I also have a responsibility to inform people of how not just Diné consider the Moon as a relative, that "colonies" are reinforcing a genocidal history of Manifest Destiny, or that satellites interrupt ceremonies and relationships with our ancestors - the stars. Many Indigenous people throughout Mother Earth are impacted by our practices. To move our practices towards a more compassionate, balanced, and open way, I stand firm that Indigenous people need to be leaders, challengers, and participants in discussions of our relationship with Outer Space.

Frank Tavares: My personal positionality within the US context is that I am a white, Brazilian-American, non-binary individual. The American side of my family is of European descent, and the Brazilian side of my family is a mix of European and Afro-Brazilian descent. Within the context of MIT, I am an affiliated researcher within the Space Enabled Research Group at the MIT Media Lab. This is an unpaid and volunteer research position. My previous scholarship on anti-colonial work has been mostly within the context of space exploration, and my formal education during my bachelor's has been in English Literature and Astronomy, with supplementary classes in Black Studies and History. I wouldn't consider myself an anti-colonial scholar but have found myself at the intersection of the space sector with a liberal arts background that has given me the tools to be a part of connecting frameworks like coloniality to how we think about space exploration. The way I first came into this line of thinking was through speculative fiction, both reflecting on the way science fiction narratives often hold colonial overtones, reading the works of those like Octavia Butler and Ursula K. LeGuin that challenge those, and working on fiction writing projects that explore those themes. That grew into wanting to take a more direct approach to current issues within the space community, including working on this seminar series.

Pedro Reynolds-Cuéllar: My standpoint is of an educated Colombian mestizo male, currently living in the United States. My maternal family are descendants of the Chitarero Indigenous People and my paternal family primarily of European and Middle Eastern descent. I am a doctorate student at the Media, Arts and Sciences department at the Massachusetts Institute of

Technology, affiliated with the Future Heritage Lab and the Space Enabled Group. I began working on decolonial theory and practice through the work of the *modernidad/colonialidad* collective in Latin America. I engage with this body of knowledge through my work creating educational experiences in technology design that are rooted in decolonial methods and my research on critical studies of technology. I came to the intersection of anticoloniality and the space sector through the teachings of the Dakota and Lakota historian LaDonna Tamakawastewin (Good Earth Woman) Brave Bull Allard, who I had the privilege to meet during her visit to MIT in 2018. In my doctoral work, I collaborate with the Arhuaco and Quillasinga Indigenous Peoples of Colombia.

Seamus Lombardo: I approach this work as a white male of European descent in the United States. Coming from an aerospace background to the extent that cultural thoughts intersected with my technical work, they originally mirrored the western lens of space colonialization and resource extraction that pervades the field. While I had previously in engaged environmental and social justice activism, these activities, and my motivation to pursue them, did not always connect to human activity in space in my mind. However, my PhD research focuses in-part on applying satellite data in forest management for the Yurok Tribe - an Indigenous community in Northern California. Learning about negative impacts that colonialism has wrought on this community and their resilient efforts to preserve their culture was a motivating experience. My satellite data analyses augment Yurok carbon sequestration project management, the revenue from which is used by the Tribe to buy back their ancestral land. These efforts exposed me to Indigenous nation building and sovereignty efforts - and how space technology could aid in advancing them. I also expanded my historical knowledge of the systems of colonialism, both in a global context through coursework, and personal connections to my hobbies (outdoor recreation in US National Forests and Parks, which have their own intersecting history with these structures [3] and heritage (learning how English colonialization of Ireland led to environmental destruction and cultural oppression [4]). As with Pedro, I also learned a lot from Alvin's talk on the story of Eugene Shoemaker's ashes being taken to the Moon and what that meant for the Navajo Nation. I viewed my engagement in the seminar as that of an interested learner, led by the same principles that had motivated my earlier activism, but with these principles now connected to my work in space by new lessons learned from my collaborators and colleagues.

2.2 What were your hopes and expectations with this seminar series?

Alvin D. Harvey: At the beginning of the seminar, and even as of the writing of this paper, MIT does not have any permanent Native American or Indigenous faculty or administration. Support of the Indigenous people of MIT, almost completely being composed of students, is and has been sparse to the point the students are burdened with the responsibility of creating institutional capacity to understand and support Indigenous people. As an Indigenous student leader at MIT, this burden is transformed as a responsibility and a desire to see justice and equity for current Indigenous students and future Indigenous students of MIT. Having a predominantly white institution built with the funds sourced from the stealing of Native American land to recognize Indigenous sovereignty and knowledge systems has been a core goal of the Indigenous student leaders of MIT. I initially saw the potential construction, the relationship building, the institutional presence of this type of webinar as part of that mission to support Indigenous people at MIT and within my own practice as an aeronautics and astronautics engineer. Nothing had ever been done like this at MIT to my knowledge, and my expectations were tempered by my previous experiences with MIT administration. The space community of MIT, and MIT itself, had little experience in questions of anti-colonialism and the presence of Indigenous scholars. Despite this early trepidation, I remained optimistic and intensely driven to see this seminar as an introduction and opportunity for my MIT and space community to be challenged and to experience Indigenous and anti-colonial ideas.

Frank Tavares: Going into this seminar series, a personal hope I had was to normalize discussing anti-colonial work within the context of space exploration, providing a theoretical framework for those discussions and concrete examples of why that framework was necessary. I also was excited to see those conversations expand beyond the circles I've engaged with on these topics.

Pedro Reynolds-Cuéllar: I was excited to get to know the space community, especially through an uncommon lens such as anti-coloniality. I had the chance to hear Alvin speaking at a class at MIT and tell the story of Eugene Shoemaker's ashes being taken to the moon and what that meant for the Navajo Nation. I was encouraged to see that other fields beyond mine were also grappling with the tensions of coloniality past and present. I also wanted to build relationships with Indigenous thinkers regardless of their connection to the space sector. I am grateful to remain in touch with

some of the seminar speakers and cherish those relationships. Perhaps my biggest hope was to be part of an initiative where I could be of service to a space designed to center Indigenous voices.

I expected conversations to be difficult, leading to multiple tensions. I imagined the audience being open and actively seeking ways to act in solidarity upon the issues, criticisms, and opportunities arising from discussions across the seminar. I anticipated that several attendees would remain in contact following the closing of the seminar or at least learn about each other's work.

Seamus Lombardo: Going into the seminar series, I hoped to provide a venue where voices I had not typically heard from in aerospace venues on the topic of human activity in space had a significant platform to share their views and experiences. I also wanted to attempt to include a variety of voices spanning the spectrum of thought in this area: from academics focused on colonialism, to Indigenous leaders, to aerospace professionals. Personally, I was interested to see how my own views and understanding, informed by my collaboration with the Yurok Tribe and coursework on colonialism at MIT, compared and contrasted with the other folks attending the seminar. I expected there to be potentially contentious disagreements between anticolonial thinkers and those who aligned with the more western-oriented colonialist and extractive views of human activity in space that typically pervade the aerospace field.

2.3 What reflections do you have on the logistics of forming the seminar series, was there anything you would have done differently?
Alvin D. Harvey: As I mentioned before, there has not been a webinar like this ever before at MIT. I commend the team led by MIT students and volunteers in creating an online gathering that brought together amazing scholars and thought leaders to discuss and challenge our relationship building with the cosmos. Our standard procedure remained consistent through the webinar series, beginning with the planning committee meeting, defining overarching webinar topics and goals, defining specific webinar themes, discussing potential speakers, contacting speakers with a proposal to speak in an online panel on the defined theme with our group, gathering the speakers that confirmed participation to find a time and date that works for speakers and a facilitator, and conducting the webinar with a short time before to have the speakers and facilitators speak to one another. An online workshop consisting of more interaction with the invited speakers was modified based upon feedback from audience members, speakers, and our experiences with the three previous webinars.

This was a very standard and "MIT" operation in terms of core logistics, focusing on producing content that aligned with our overarching themes and topics. Opening the webinars to the public was the correct format, although we had to be aware of disruptive individuals in our online format, we still had tremendous turnouts and intense interest from audience members. What I feel that we did not account for was the building of sustained collaborative relationships with the many amazing speakers we had. The core component of that relationality that I affirm in my statement of positionality was not a core logistical aspect of this webinar series, in part to my own ignorance at that time. The journey of understanding my Indigeneity and my peoples' ways has allowed me to look back at the planning and construction of these gatherings critically, and intensely critical at my western based approach to contacting and remaining in contact with speakers and my willingness to pressure Indigenous speakers to speak, without an honorarium, on our panels in a set timeline.

Time is often treated as an enemy in our aeronautics and astronautics world. We are rushed to obey a set timeline often at the sacrifice of our work quality, our health, and our relationships. We gave up our relationship building capabilities with the speakers to obey this artificial time construct we collectively agreed upon. To truly affirm Indigenous people in the Institution I attend, there is a fluid and better way of building sustained relationships and research collaborations beyond a seminar series. There should have been more of an effort to build communication with speakers early and allow and encourage speaker input on the theme and format of the seminar. Perhaps if we had a more reciprocal relationship with our speakers our webinar series could have reached a broader audience and allow for deeper and enriching conversations. Overall, when it comes to contacting our potential speakers, I reflect now that it should have been done with a good heart up front, with honesty about our budget and restrictions, and with an abundance of bravery in challenging traditional "MIT-ness" in creating a type of space we really desired.

Frank Tavares: Overall, I think our organizing group did an excellent job consistently bringing together a series of fantastic guests from a variety of disciplines to discuss topics deeply important to the future of space exploration. We had a standard formula which we mostly stuck to for the first three conversations, and re-worked that format for the fourth workshop, where we integrated some of the feedback, we received around wanting more room for audience participation.

There were moments when I feel our desire to stick to our original calendar caused us to rush in ways I may

have done differently with hindsight. Our intent was to time our third webinar around Indigenous People's Day on October 11 but leading up to that date we hadn't filled out our roster of speakers, and didn't have any Indigenous voices on the panel. This resulted in having to make several last-minute requests to meet our timeline. Often, that simply is the nature of organizing an event series, but it did cause me to question what our primary intent was – why was hosting a conversation around Indigenous People's Day more important than ensuring we were bringing the right voices into that conversation? What kind of position did that put both our Indigenous and settler speakers in, to know this conversation was intentionally placed on that milestone? Ultimately, that third webinar went well, as did the seminar series. But it did cause me to reflect on whether a traditional seminar series was the best kind of format for nuanced conversation around anti-colonial thought. It was public facing, meaning publicity and to some extent, marketing were aspects that had to be considered in decision-making. Our interactions with speakers were functionally transactional, and not oriented towards long term collaboration or co-creation on equal footing.

The other aspect of reflection was pay. We were not able to offer our speakers any kind of stipend until the end of the series, except for Dr. John Herrington's speaker fee which was covered by the MIT Native American Student Association. As an affiliated researcher, who is neither a student with MIT nor staff and doing this work on a volunteer-basis, I didn't feel I had the latitude to push for paying our speakers – but in retrospect, think this was a serious misstep. Especially when hosting these discussions through a lab connected to MIT, one of the wealthiest institutions of higher education, on the issue of anti-colonial work and in collaboration with several Indigenous scholars, it doesn't sit well with me that we asked for unpaid labor at the start. That we were retroactively able to provide some financial support is a positive, but this should have been a part of our budgeting for the project from the beginning.

There also ended up being a mismatch in our intended topics and where the focus of our discussions often ended up. In the first seminar, there was a divide in expertise that was fruitful in many ways between the anti-colonial scholarship of Dr. Uahikea Maile and Dr. Natalie Treviño and the engineering expertise of Dr. John Herrington. Our goal, for that seminar to provide a theoretical framework for anti-colonial work in space, became secondary to Dr. Herrington's narrative of his life story and engagement with the theoretical work of the other speakers. This discussion across expertise was fruitful but mismatched with the original intention for

that event and its function in the larger series. Our second seminar matched the most closely with our stated topic, around lunar exploration, but could have been more powerful if we framed it specifically around the more specific question of Indigenous perspectives on the Moon and its use, using the Lunar Prospector incident [2] and similar present-day practices.

The third seminar, mentioned above, was intended to focus on issues brought about by Mars exploration. The conversation ended up focusing on how to engage Indigenous epistemologies and moving beyond a framework of diversity for diversity's sake, steered by the deep knowledge of Dr. David Lowry and Dr. Ren Freeman in Native American Studies and Indigenous research.

All these conversations were deeply valuable. But had we worked more closely with our speakers earlier in the planning process, and afforded ourselves the time to do so, we may have found our intended structure did not match with the expertise and interests of our speakers and been able to re-tool our plans to be a better fit.

Pedro Reynolds-Cuéllar: Overall, I think the organizing team did a good job putting together a series of events following a thread that made sense and that gave the opportunity to center Indigenous voices in this conversation. There is always a question for what the most ideal format is to mobilize conversations at a time when seeing each other in person was not a possibility. While I acknowledge that seminars are not the most conducive format for fostering connections and relationships among attendees, I personally was more interested in voices who are not commonly highlighted to take as much space as possible. In that sense, I think seminars are an appropriate format for making that centering as the starting point. The closing workshop provided an opportunity for the community that attended the previous three seminars to connect and share with each other. In retrospect, having had this facilitated workshop earlier could have given us the chance to strengthen the community and respond to feedback in upcoming events. I remain hopeful this is something we can do in future events.

During the pandemic, and across a variety of virtual venues, I noticed an increase in the amount of unpaid labor that is required from members of different communities. Though I acknowledge the upside of participation in spaces previously inaccessible due to geographic or other obstacles, I do not see this as enough explanation for not rewarding hard work. This seminar was no exception. This is always a tough ask, but the fact that we were working with members of historically marginalized collectives, it makes it more

sensitive. This is particularly striking given that MIT is one of the wealthiest universities in the world, not to mention it is built on the backbone of Indigenous land acquired through the Morrill Land-Grant Acts. Proactively offering speakers to be paid for participating in these kinds of spaces is something the seminar can improve upon. Though I did not hear from any of the speakers I had the chance to work with about our timeline being an issue, it is certainly possible that some of them were uncomfortable given how fast paced some events were. These arbitrarily imposed schedules, modelled after the hyper-productive, often toxic culture of places like MIT, is something I would like to defuse in the future.

Seamus Lombardo: I think the organising team worked hard to implement an event that was in keeping with our goals and principles. We successfully found speakers with knowledge and experience well suited to the topics, though I share my fellow organiser's regrets that we did not place more emphasis on compensating all these speakers from the beginning of the organising effort. In my work developing satellite data-based analyses for communities like the Yurok Tribe, I have strived to incorporate the principles of co-creation [5] and inclusive innovation [6]. These principles are equally applicable to the planning of an event like this. We as organisers did incorporate attendee feedback and adjust the event logistics to a more interactive workshop for the final event. However, in retrospect, it would have likely produced an even more meaningful event, had we engaged in true, broad-based co-creation and inclusive innovation with folks throughout this community from the beginning.

Similarly, in my co-development of satellite data analyses to supplement the natural resource management efforts of the Yurok Tribe, we have placed much emphasis on ensuring that this work has longevity even after my graduation. The focus of this work is discussing how the goals of this event series could work towards similar longevity. In hindsight, I think ways to promote the longevity of this community, its discussions, and any resulting actions, could have been more structurally built into the event logistics.

2.4 How have your perspectives about and the methods of doing anti-colonial work changed, if at all?
Alvin D. Harvey: I touched a bit on how the Indigenous speakers ignited a path for me in connecting with my Diné culture and research paradigms. What was also informative was the experiences with the team and institution that planned and sponsored the webinar series. I realize now that speaking about anti-colonial

work and the centering of Indigenous epistemologies is simultaneously different and similar in form, feeling, and appearance to doing anti-colonial and Indigenous work. The open discussion of these paradigms is needed to implement them, and in my Diné paradigm the continued discussion of this work, even during it, must be a part of it. What is largely different between speaking and doing in this specific case is that I am aware of how the academic and professional structures we operate in can reinforce what we are challenging. Doing this type of work means that you prioritize the development and maintenance of relationships with collaborators and community. My methodology and methods of this prioritization means that when I wish to collaborate with Indigenous people or welcome them into a space I am a part of I will focus on communicating with them open and honestly, I will try to support their work and be reciprocal, I will compensate them for their time and generosity, I will focus on establishing our relationality and friendship. Our people and our community do not need more detached and hierarchical collaborations that focus on outcomes and resource extraction. Patience, a good heart, honesty, the focus on the "soft skills," and the bravery to confront institutions and monsters will help with doing and speaking a better way forward into existence.

Frank Tavares: My biggest take-away from this experience, both as an organizer and as a participant and listener in these events, is that how one does anti-colonial work – the structures, methodologies, intent behind any given project – is in essence a major part of the work itself. Changing how we produce knowledge is part of the work that needs to be done. Academia is steeped in structures that prioritize outputs over collaborations, don't prioritize people's needs and desire for community, and ultimately serve to benefit the institutions that are able to fund such efforts – often the very same institutions that uphold systems of coloniality. In that vein, my approach moving forward in collaborations and projects around these topics is to prioritize relationship building over external milestones, ensuring that the work being produced is in service of enabling structural change in some way rather than aestheticizing diversity. Living under modern capitalism, research needs support from funding structures in one way or another, and so the relationship between anti-colonial work and the institution supporting it is one I'm also bringing a more critical eye towards going forward.

Pedro Reynolds-Cuéllar: Several speakers I had the chance to interact with helped me cement my commitment towards solidarity as the driving principle

for anti-colonial work. Since I began engaging with decolonial theory back in 2016, I felt uneasy about not being involved in the strugglers named in this literature. This was particularly acute in the case of decolonization movements in the United States, where land back is such a fundamental part. I began involved in political action related to Indigenous Peoples back in Colombia, as well as learning more about what collectives in the U.S were doing. After the seminar, I feel more engaged and energized to become involved with this work as I continue to learn from these scholars and activists.

Falling again into some of the traps of modernity: optimization, imposition over the conditions of participation, ownership over how time is managed, has reaffirmed that I still have work to do to fully counteract this way of thinking and being. It makes it clear that this unlearning work requires persistence and discipline.

I certainly regret that we did not have more methodological discussions about how to approach anti-colonial work within the space sector and more generally in our daily lives. Speaking about the anti-colonial "what" without meaningfully engaging with the anti-colonial "how", leaves us all without key tools to act upon these conversations.

Lastly, I take our move from seminars to workshops as a metaphor of moving from conversations into relationships. Our methods should now help us move into sustaining and nourishing these relationships and doing so while we find together ways to act upon the work in solidarity with anti-colonial struggles.

Seamus Lombardo: One of the key takeaways from primarily approaching the seminar series as a learner, was the diversity of views within the community. Even among those who prioritise an anticolonial perspective on human activity in space, that perspective can take many different forms. The community of anticolonial thinkers formed over the course of the seminar had a range of different views on what the principles of anticolonialism mean in practice for future human activity in outer space. This takeaway has widened my own personal perspective of possible futures for human activity in space and furthered my own intellectual journey which began with the western-colonial view of space colonialization and resource extraction. I strive to maintain this open mindedness, broadened perspective, and active listening in the implementation of my PhD research developing satellite remote sensing analyses for communities in sustainable development.

3. Summary of Audience Survey Responses
Following the seminar series, all attendees were provided with access to an anonymous feedback survey. Composed of 13 questions, the survey was geared towards learning about the value, success in centering Indigenous voices, and general sentiment around the seminar, along with feedback on logistics and content provided. Respondents were also asked about topics they would like to see later in the seminar along with specific suggestions of people that could speak to those topics.

28 people based in 10 different countries responded to the survey. Because this data was initially collected for informal feedback and not research purposes, we will not be reporting on the raw data but speaking generally to the results. Most found the seminar series very or extremely valuable for their professional development. The vast majority of participants stated that after attending the series, they considered these themes to be of extreme urgency for the space community. Participants agreed the series centered Indigenous voices, and most – though not all – found the series helpful for advancing conversations around anti-colonialism in space.

With regards to the topics of the seminar, respondents mentioned a need to make content more concrete in practice, especially for folks currently in industry, with some stating they couldn't give a definition of "anti-colonialism in space". More attention to international diversity, specifically around themes related to law was also suggested in the survey. Other interesting suggestions regarding themes and ways in which Indigenous participants could be part of the space community were made, pointing to projects such as including plaques on spacecraft and involving Indigenous voices in mission planning. We also received feedback regarding how to improve the current layout of the seminars for future events. Expanding geographical reach as well as making topics as specific as possible, also came as direct feedback throughout the survey. In addition, respondents suggested a tighter integration of seminars of this kind into strategic academic spaces such as popular university courses across multiple schools. Lastly, respondents suggested using this opportunity to collect, curate and share resources around topics related to the seminar.

4. Discussion: Reflections on the Seminar
These responses from the audience when viewed alongside the reflections from the organizing group provide valuable insights on how the format of a seminar can best be used for discussions around anti-colonial work and serve as a starting point towards conceptualizing larger structural change and action. Audiences desired more concrete takeaways and next steps for advancing anti-colonial work in space. The

organizers found themselves reflecting on the internal dynamics at play and gravitating towards a more community-oriented structure for potential future work. These two reflections are complementary and point to a potential path forward – recognizing that structure and content are both interconnected within anti-colonial work.

Being more intentional about the structure and space being created in conversations around anti-colonial work can help in creating more specificity in the content itself. Had more of our guests been a more integral part of our internal discussions around topics for each seminar, we may have been able to identify the themes of commonality found across the events and avoid some of the mismatch between our planned structure and the content of the discussions themselves. Recognizing the overlap between structure and content also re-contextualizes conversations around pay. Payment or lack thereof of contributors, especially those of Indigenous and marginalized backgrounds, by MIT becomes not simply an organizational item to be considered, but a place for conversation around the role of labor in continued colonial dynamics.

One could also remove the framework of the seminar altogether, instead focusing on bringing together a group of scholars, speakers, and interested parties at a variety of career levels together for a series of non-hierarchical conversations. That less structured setting, without the same kind of distinction between speakers and audience, could help hone in on specific projects, topics, and areas of common interest. Such a structure could also consider how personal, and group growth can be a part of an iterative process. Most organizers expressed ways their views evolved over the course of the series, and this did impact their work as they continued. Grounding relationships, reciprocity, and growth could have allowed a variety of projects, including a more formal seminar-styled event, to grow naturally out of collaborations built on trust. Many aspects of the work we did may have been quite similar. But perhaps the reason this shift feels like an important reflection is due to the nature of anti-colonial work – anti-colonialism is a modality, and to engage in work that doesn't attempt to reflect that modality can create a lack of direction.

It's important to acknowledge that there are many groups that center Indigenous thinking in the sciences and engage in anti-colonial work. It is outside of the scope of this paper to study the practices of those groups, but the authors want to acknowledge that as we reflect this project, many groups are already doing this

work and leading by example. Another significant data point from the audience survey was the strong understanding of the urgency around these themes. Communicating that urgency was one of the core goals of the organizing group [2], and the natural question upon recognizing that urgency is how to work towards solutions. To that end, the rest of this paper will be expanding upon these reflections and how they are relevant not just for projects such as a seminar, but broader anti-colonial work within the context of colonial institutions involved in space exploration.

5. Towards Anti-Colonial Action
A theme cutting across both the organizers of this project and the feedback from participants was a desire to see conversation translate into action. What does anti-colonial work within the space sector actually look like? Part of the difficulty in giving an easy answer to that question is that it goes to the core of the vast majority of structures that make space exploration possible. The venues for work in space – governmental entities, private companies, academia – are all steeped in histories intertwined with that of colonialism. Doing anti-colonial work must mean changing those institutions, the way knowledge is produced, community is formed, how impact (environmental or otherwise) is handled. The default approaches to research and exploration in venues where space projects traditionally happen will not be able to produce work that functionally changes the approach currently being taken in space. The "anti" of anti-colonial is not simply an acknowledgement of past or present wrongs to be considered in future work, it means a dismantling of the power structure that upholds the normative systems of the Western world. Naming a structure of oppression is not the same as creating a theory of change, but it is a start. This section doesn't provide a fully formed theory of change but is simply an attempt to translate our reflections on this project towards threads that can lead to changes in practices to disrupt those systems of power.

There is a need to move from conversation into anti-colonial action and structural change. But not grappling with the nature of how work that describes itself as anti-colonial interacts with the systems it seeks to disrupt can lead to efforts being co-opted and blunted to be effective only to the extent they are not threatening to those existing systems. Therefore, the place to start is to think about the relationship between the individuals and communities doing this work and the institutions they are a part of. How does the inherent contradiction of doing anti-colonial work within these spaces become something productive and sustainable? Without

strategies to navigate the complexities of the realities we exist in, moving into action becomes difficult. Ultimately, the goal should be to engage in work that strives to build structures in replacement of and not in service to these institutions.

5.1 Aesthetics of Diversity, Equity, and Inclusion
There is space for discussion around anti-colonial thought, brought about in part by renewed interest in diversity, equity, and inclusion, but there's a way in which framing anti-colonial work within that context becomes a trap. "DEI", as its often referred to in the corporate world, has become a complex of its own, integrated within the systems of capital as a way to project a sense of radicalism, but often without changes in working conditions, consequences for abusive or discriminatory supervisors, and meaningful structural change. Across the space industry, whether in commitments from university leaders, CEOs of space companies, or additional core values from federal agencies, verbal commitments to DEI work are commonplace. But more often than concrete plans for fundamental changes to how an institution operates – through re-evaluating funding structures, hiring practices, etc. – the priority becomes to cultivate an aesthetic, curating people, projects, and language to support that image.

The term "anti-colonial" can easily serve that function, as can superficially engaging with Indigenous voices. Ultimately this tokenism ends up replicating familiar dynamics, in which Indigeneity only exists within a space to benefit others. Land acknowledgements are an example of how this aestheticization functions more widely. Simply acknowledging the presence of an event on stolen land, without action to build relationships with Indigenous communities that are reciprocal, is a statement without substance. It is useful in bringing forth unspoken histories, serving as an educational moment for non-Indigenous people, but once it becomes normalized to the extent of becoming habit, it's stripped of its power without any further action. Instead of illuminating a history hidden by an institution – a reminder that land was stolen – land acknowledgements when done poorly and without more work being done outside of them can feel almost boastful – "yes, this land was stolen, we acknowledge it, and are making no efforts to give it back." The use of Indigenous nomenclature for naming planetary objects participates in this dynamic as well [7]. Without effort put into relationship building, involving Indigenous people in the missions that study these objects, and engaging in a process of co-creation, the action of naming itself remains performative.

This pattern, of language without substance, is at the core of an aesthetic of social justice. What is the function of highlighting an Indigenous or anti-colonial scholar for an event, while continuing to receive funding from defence contractors that build weapons perpetuating imperialist violence overseas, as the MIT Media Lab, and by extension the Space Enabled Research Group, does? It's hard not to see that work as developing an aesthetic that obscures involvement in ongoing, systemic violence. The work itself, and those involved in doing this kind of research and work, are often working in good faith. But the reason this work finds support and is funded isn't with the ultimate goal of challenging ongoing colonial efforts and imperialism abroad – it's to distance the aesthetic of an institution from those material realities.

It's useful to recognize this, to name the value of this work to institutions embedded in systemic violence as aesthetic, because it allows those of us doing this work to be wary of praise and know exactly where to redirect – in highlighting those contradictions. If the grounds upon which those doing anti-colonial work and the institution can be re-established to center those contradictions, something else can be rebuilt. Instead of anti-colonial work being about proving an institution is "post-colonial" or "post-racial", the institution itself can become a subject of anti-colonial work.

5.2 Operating within Colonial Institutions and Relationality
To highlight the contradictions of MIT in its aesthetics of creating a better world and its treatment of Indigenous people and students is towards a justice making that is anti-colonial. What does this highlighting look like in practice? The difficult reality is that institutions steeped with colonial violence proliferate this violence upon its disempowered students. The expectations to highlight, to truth tell, and guide hands is upon students, particularly when it comes to issues impacting Indigenous people and anti-colonial work. Beyond notification and education, a common inquiry is what do we do? What can those with institutional power do to advance not just anti-colonial thought but action as well?

At an essential level and as a beginning action those in institutional power should move towards the creation of relationships with Indigenous people, communities, and nations. Higher education institutions like MIT and corporate and government entities in the space community also must begin this practice of creating relationships with Indigenous people, communities, and nations. These relationships should be based upon Respect, Relevance, Reciprocity and Responsibility. These beginning relationships should always be guided

by respect of Indigenous culture, science, and sovereignty and mechanically be guided by Indigenous people themselves. The intended relationships, partnerships, and efforts at co-creation should be relevant to the Indigenous partners, which is assessed through the consultation of the Indigenous partners. Reciprocity in relationships with Indigenous people is a new concept to colonial institutions, and often must be reintroduced and reinforced. Reciprocity is the practice of exchanging ideas, goods, credit, resources with Indigenous partners for mutual benefit. A further component of reciprocity is the understanding that colonial institutions like MIT and space government and private entities, must make amends physically and morally for historical and ongoing physical and cultural violence upon Indigenous people and their ways of life. This journey of coming to understand the history of how Indigenous people have been and are being treated is the responsibility of those in positions of power. Self-education is not a burden but an action that prepares one to fully appreciate the difficulties of those educators and truth tellers that enter boardrooms and research spaces that have little to no understanding of or experience with Indigenous people. This is a learning journey, there will be hard lessons in maintaining Respect, Relevance, Reciprocity and Responsibility in this work. We can begin with building these conversations, relationships, and friendships with Indigenous people in a way that is transparent, honest, and prioritizes the needs of Indigenous people. We start this journey together because we are all operating in colonial institutions which are in dire need of structural improvement.

5.3 Beginning Structural Improvement
The return of Indigenous Land is not an abstract political movement or a metaphor [8], it is an entirely possible sociopolitical and cultural doing. This means the return of stolen Indigenous land. Perspectives on how this process should be done can vary in terms of time and process, but what is clear is that the assertion of Indigenous sovereignty, nationhood, and personhood is tied to the land and has been so since time immemorial. In the case of what is known as North America, Indigenous people were the sovereign caretakers of the land; with each diverse tribal nation having their sustainable practices and relationship with the environment in ways that prevent environmental catastrophes. With the onset of colonization and attempted genocide Indigenous people were forcibly removed from their homelands and policies formed to prevent them from practicing their traditional sustainable practices. For many that benefit from this Indigenous land, in our case an academic institution on

Indigenous land that continues to draw profits from Indigenous land, this right to the return of Indigenous land is a non-starter. It is obvious that there is a great deal of complexity in accomplishing and maintaining Land Back, but what is obvious is that this process and simply the discussion of it must include Indigenous people. Consultation, consent, and relationship building with the Indigenous people who called this home is a key component of Land Back [9]. This is anti-colonial; the restitution and the reversal of what colonization is meant to do.

These efforts should not be seen as beyond the scope of anti-colonial work in the space community. All activities in space that take place within the Americas have a relationship to land that is stolen. That includes land used for launching rockets into space, land that is exploited to generate power for supercomputing facilities and data centers that run models, land that holds telescopes used to observe the stars, and more. This is seen across the Americas, from the struggle to push back against the Thirty Meter Telescope at Mauna Kea [10] to the expansion of the Alcantara Space Center launch site in Brazil that is displacing African-descendent communities [11]. Part of an anti-colonial practice is acknowledging this reality not simply through statements but integrating active engagement and solidarity with movements towards the undoing of those wrongs.

6. Conclusions
Our reflections on the project of this particular webinar series, and anti-colonial work in space more broadly, are wide-ranging and do not represent a solidified framework or methodology. There are several key points to summarize these reflections to highlight as takeaways we are carrying forward in our future work and offer to the broader space community. When engaging in anti-colonial work:
- Cultivate a practice, not an aesthetic
- Prioritize relationality, community, and reciprocity
- Engage materially with decolonial work and Land Back movements

By shifting away from projects that meet temporary, fixed milestones contributing to an institutional image and towards projects that prioritize long-term relationship-building and providing tangible benefits to Indigenous peoples and collaborators, the institution itself becomes the site of struggle rather than just the benefactor of the labour of others. Consistent practices over the long-term have more potential to enact institutional change than one-off projects. Prioritizing relationality and community-building establishes bonds that exist beyond the institution. Centering Land Back

movements requires institutions to engage with the material realities of what support for Indigenous communities means. These actions are a start towards pulling at the tension that arises when doing anti-colonial work within colonial institutions and using it as a tool to destabilize colonial structures.

Ultimately, anti-colonial work means re-shaping what kinds of relationships we have with each other, with land, and with the social, political, and economic structures that make up our lives. That shift can begin at the interpersonal level, where the day-to-day of any project or activity takes place. Though the structures being grappled with in anti-colonial work seem all-encompassing, there is power in this realization that one of the best places to translate conversation into action is simply in how we collaborate with one another. On its own, these changes can't dismantle the powerful structures that maintain colonial practices, but they can start the work of building alternative frameworks and ways of being, illustrating the path towards a better future in space and on Earth.

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