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#### 1] Space management cannot be understood outside of settler colonialism. The infrastructure, institutions, and Eurocentric values of space policy are considered the hallmarks of science and progress, which become weaponized against Indigenous resistance.

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Mauna Kea is a dormant volcano and the highest point on the archipelago of Hawai’i. When measured from its base at seafloor, it is the tallest mountain on earth. These towering heights, in a region of the world with minimal light pollution has also earned Mauna Kea recognition of being one of the best spots on the planet for examining the cosmos. Long before the development of modern space infrastructure, however, the peak of Mauna Kea was regarded by native Hawaiians as among the most sacred places on the archipelago of Hawai’i. The place where earth meets the heavens. These divergent perspectives are embedded within a larger relationship of imperial domination that has seeded a century of unrest. While the primary focus of the protest was to challenge a half-century disregard for this sacred site by numerous entities and interests, the Battle for Mauna Kea cannot be understood outside Hawaii’s 125 year-long history of colonial occupation. In 1893, the Hawaiian Kingdom and its Queen, Lydia Kamaka’eha Lili’uokalani, were overthrown by a US led military coup (Long, 2017). Speaking to a spirit of resistance that has existed on the islands since the coup, scholar-activist K. Kamakaoka’ilima Long (2017: 15) states: “four decades of land struggles and cultural historical recovery… have grown a Hawaiian sovereignty movement… playing out in both land defense and as a movement to re-realize Hawaiian political independence as a sovereign state.” This recent assertion of self-determination, now known as the battle for Mauna Kea, has grown to become a global movement with broad support from high-profile figures and the hashtags #Wearemaunakea, #ProtectMaunaKea, and #TMTshutdown trending widely on social media. More than just a source of inspiration for the groundswell anti-colonial movements around the world, this story provides a context to better understand ongoing colonial occupation that is reinforced through the constitutive power of space infrastructure. Working from decades of resistance that culminated in the “battle for Mauna Kea,” we engage the notion of colonial totality to conceptualize the resistance to space infrastructure and the ongoing US occupation of Hawaii, reflecting on what this movement provides for better understanding totality and the relationship between space infrastructure and the shifting nature of colonial occupation more broadly. The notion of totality describes the process by which occupied spaces are coded with Western values in the form of normalized cultures, epistemologies, and institutions that produces an “atomistic image of social existence” (Quijano, 2007: 174). The institutions, ideologies and systems that advocate for the construction of space infrastructure exemplify this process. Astronomers frame the building of the observatory infrastructure as an essential piece in advancing our knowledge of outer space and ultimately achieving ‘universal’ progress. The resistance to development of these infrastructural systems is an invitation to consider the relationship between space as a frontier of discovery and ongoing questions of settler colonialism; the blockade has made visible the inherent relationship between the infrastructure of scientific exploration and the logic of totalizing colonial rationality that enables the development of massive telescopes on occupied land. While these perspectives of colonial totality provide a useful understanding of power and institutions that shape this conflict, we suggest that the Hawaiian land defenders’ refusal of the normalizing force of space infrastructure demonstrates the complexities and conditions relating to the notion of totality and ultimately the inadequacies of the concept. During a public comment period at 2015 University of Hawai‘i Board of Regents meeting, Dr. Pualani Kanaka’ole Kanahele gestures to both the totalizing colonial discourse that suppresses her cultural beliefs and the importance of fighting back against these systems: … we believe in the word of our ancestors…they say we are the products of this land and that is our truth…and that is what we are fighting for. This is our way of life. This is not our job. We don’t earn money from doing this. But for generations after generations, we will continue to be doing what we are doing today. What Dr. Kanahele speaks of goes beyond the physical destruction of the sacred ancestral site, to describe a hegemonic normalization and occupation that actively effaces traditional Hawaiian ways of being in the world. The words and actions of the land defenders challenge totalizing structures that classify space according to a narrow set of beliefs about the world. Working from these acts of resistance, we want to suggest that the Hawaiian sovereignty movement illuminates how systems of scientific thought and the project of space exploration rely on Euro-western values being the standard by which all other values are measured. It is this wide acceptance of these structures and principles of reasoning that serve to justify the construction of infrastructure that at once reproduces and fortifies these myths. This self-reinforcing relationship between the production of space infrastructure and the logics that justify it speaks to a powerful aspects of colonial totality: the way it gains power by rendering illegible the very elements relied upon to actively produce the other. The generally unquestioned salience of space infrastructure is a powerful example of this. As Quijano (2007: 174) describes, the relationship between colonialism and scientific discourse is a mutually reinforcing and “part of, a power structure that involved the European colonial domination over the rest of the world.” In Hawai’i, we see the settler colonial process of cultural attrition operating through a totalizing force of colonial knowledge systems that extend beyond physical occupation of land to include an erasure of Indigenous Hawaiian ways of knowing. Although the spatialities and technologies associated with this form of stellar navigation are radically dissimilar, we suggest that on a basic level, this form of space exploration is continuous with a lineage of Euro-western projects of discovery. In short, space as the ‘final frontier’ is not simply a metaphor but speaks to the role of astronomy in upholding the ongoing projection of values onto new territories and extending power and acquisition of territory to those complicit in colonial processes. This extends both to the world’s highest peaks and into the heavens. Space infrastructure is central to this ongoing frontier process that seeks to code ‘new’ territories as knowable according to certain values and, as a result, casts inhabitants who fall outside this paradigm as irrational, less-than-human, and exploitable. However, as Lowe (2015: 2) warns, these abstract promises of human freedoms and rational progress are necessarily discordant with the “global conditions on which they depend.” Which is to say that these atomistic systems dispose of the very relationships and elements of life that make them possible. A belief in respecting the sacredness of the world is just one example of this. It is also essential to recognize the process of establishing colonial totality is one that imperial forces have worked tirelessly to instill. Recognizing this helps to disrupt an appearance of givenness that colonial occupation relies upon. The land defenders have been vocal about this, reminding of us of the fact that since the arrival of James Cook to the Hawaiian Islands in 1778, settler colonial campaigns have been advancing longstanding patterns of cultural removal, fueled by beliefs in colonial supremacy. Following the coup and overthrow of the Hawaiian monarchy by US-led forces, a colonial oligarchy banned Hawaiian languages from schools and formalized English as the official language for business and government relations (Silva, 2004: 2-3). This legislation eroded language, culture, and sacred practice; and is an example of what Ngũgĩ wa Thiong’o (cited in Silva, 2004: 3) describes as a “cultural bomb” of settler colonialism that serves to “annihilate a people’s belief in their names, in their languages, in their environment, in their heritage of struggle, in their unity, in their capacities and ultimately in themselves.” According to Chickasaw theorist Jodi Byrd, continually reflecting on the historical and ongoing work that maintains the conditions of settler colonialism is essential to resisting the tendency for colonial constraint to appear inevitable, unresolvable, and complete (Byrd, 2011; see also Simpson, 2014). There was nothing, easy, given, or natural about processes of colonial occupation. While we acknowledge the usefulness of totality for thinking about colonial supremacy, we have concerns about its tendency to inscribe an inaccurate depiction of Euro-western superpower with total ideological control over subjugated Indigenous population. Put differently, we are cautious of the work that the notion of totality does to reinforce a too widely accepted view of Indigenous populations as helplessly dominated, or even anachronistic. The Hawaiian sovereignty movement demonstrates that this is not the case. What the battle at Mauna Kea has shown—akin to other efforts of refusal, such as those at Standing Rock—is that the war against colonialism is ongoing. At present, it appears the land protectors have been successful in their goals of halting construction, as the development team behind the project has begun considering secondary sites for the telescope. The resistance at Mauna Kea, then, is a powerful symbol of the possibility of rupturing the normative totality of Modernist scientific rationality, but it also underscores the recalcitrance of the structures of control and the challenges of pushing back against colonial occupation. However, despite this rupturing of hegemonic ideas of science and progress through the resistance movement, the dominant response from the scientific community has been largely one of confusion and perplexity. This reaction to the uprising speaks to the power of the narratives that cement the Western framework as ‘truth,’ ‘natural,’ and ‘given.’ For these representatives of state and international institutions, violent control is re-framed as co-existence to achieve Modernist notions of progress, while the claims of Indigenous people are reduced to frivolous demands with primitive and irrational connections to the past. This, of course, exists with little consideration of the irony of how this frenzy to build infrastructure that works to “know” the cosmos may be read as equally irrational. This essay has sought to consider the relationship between infrastructure and colonialism, emphasizing that even the most futuristic space telescopes have embedded within them a lineage of Euro-western cultural supremacy. It is important to recognize the extant materiality of these infrastructures as a manifestation of hegemonic systems that perpetuate myths of rationality and Euro-western cultural supremacy. The battle for Mauna Kea movement highlights the importance of remembering the long historical processes and extensive exertion of colonial constraint and cultural removal that has been necessary to maintain control of the land. Despite the social processes that naturalize colonial infrastructure, there is nothing essential, necessary, or pre-ordained about enormous telescopes. The success of the land defenders at Mauna Kea, and the support the movement gained around the world, shows us that Euro-western forces and the infrastructure that is central to maintaining their normative influence, are replete with fissures and contradictions worth pushing against. In spite of the hegemonic forces of modernity and rationality behind the construction of the TMT and a continued attempt to assert colonial totality, the battle at Mauna Kea indicates these hegemonic forces have been far from totalizing. The colonial powers do not have the final word. The land defenders at Mauna Kea have demonstrated a powerful vision for disrupting normative ways of occupying land and knowing the cosmos inspiring us to think further on the complexities of mobilizing infrastructure to resist colonialism. It is within these ruptures that we see a potential for a continued learning from the stars and our social existence.

#### 2] Treatymaking is a form of settler diplomacy that seeks to legitimize colonial authority through legal justifications. Native Nations are rendered primitive and lawless as the plan eliminates any trace of indigenous sovereignty.

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(Joseph Bauerkemper Assistant Professor, American Indian Studies, Heidi Kiiwetinepinesiik Stark. Turtle Mountain Ojibwe, received her Ph.D. in American Studies from the University of Minnesota, 2012, The Trans/National Terrain of Anishinaabe Law and Diplomacy, Journal of Transnational American Studies, 4(1), JKS)

Throughout the ongoing and always transnational processes of interpolitical negotiations, obligations, and interactions, Native nations continue to retain and express their own ideas of nationhood and exercise their long-standing diplomatic traditions. Whether by establishing or renewing political, economic, and other strategic alliances across the transnational terrains of Native North America and colonialist North America, Anishinaabe diplomacy asserts Native nationhood and disrupts colonizing narratives of discovery and conquest that have served to legitimize settler-state establishment and expansion. Thus, an examination of Anishinaabe diplomacy as illustrated in the opening story of Maudjee-kawiss and the Bear Nation can reveal a particular instance in which Native American Studies challenges, critiques, and contributes to transnational scholarly frameworks. By centering Anishinaabe nationhood, diplomacy, and intellectual traditions, we inherently enter into the realm of the transnational. The Anishinaabeg, whose homelands span the Great Lakes and the Plains, have since time immemorial entered into intranational alliances among Anishinaabe bands as well as international treaties with other indigenous nations and colonial states. For example, throughout the eighteenth and nineteenth centuries, the Anishinaabeg tracked how treaty practices were carried out across their bands and utilized this knowledge to their advantage whenever possible.22 Through their engagement across bands, the Anishinaabeg were able to discuss various issues pertinent to their treaty relations with colonial nations, such as how much land was retained, the amount paid for ceded lands, and which hunting and fishing rights had been preserved. Thus, various bands informed one another’s political thought and practices when they engaged in treaties with Canada and the United States. In addition, the Anishinaabeg often used treatymaking, especially along the border regions, to both protest and utterly disregard US and Canadian border constructions that would affect the internal affairs of these nations. Native peoples have long been reckoning with what it means to live in a multicultural and multinational world. Well before the arrival of Europeans, Native nations were participating in social, economic, and political alliances that required engagement across national borders, kinship networks, and differing epistemologies. Carried out through stories told, customs practiced, and commitments fulfilled, these diplomatic interactions were themselves sites of nation-building in which communities articulated their understandings of what they were and imagined what they hoped to become. On their arrivals in the Americas, European nations—all of which depended on political and economic alliances with Native nations—would find themselves needing to engage with and employ indigenous diplomatic practices and discourses.23 Such diplomatic discourses were thus ironically fundamental to settler-state formation. Treaty-making served as the main practice through which the existence of colonial nations as sovereign states was legitimized. Diplomatic engagements were sites in which nations asserted, negotiated, and recognized competing conceptions of and claims to sovereignty, nationhood, and land rights. For example, the United States could assert to European nations that it was a sovereign state because it had acted as such by making treaties with indigenous nations. These assertions had weight because these indigenous nations had already been recognized through the European states’ own treaty-making practices. This treaty-making rationale combined with discourses of “discovery” and “conquest” in a logically fallible but politically expedient pursuit of US and Canadian state-formation. US and Canadian cultural discourses position Native peoples as “savage” while political discourses concurrently acknowledge (even if reluctantly and inconsistently) the sovereignty of Native nations. Even while such trajectories might appear opposed, the legal discourses of both nation-states selectively apply the sentiment of savagery and the recognition of sovereignty toward settler colonial purposes. Robert Williams argues that “these divergent discourses on Indian legal status and rights were all derivative of the larger and more direct question . . . regarding the rationalization of the land-acquisition process on the colonial frontier.” 24 Ultimately, colonial legal theory, which sometimes asserts the sovereignty and property rights of Native peoples, is often overridden by cultural discourses that fabricate legal justifications for US and Canadian assertions of settler sovereignty. Practical realities and processes on the ground, such as treaty-making, that recognized the status of Native nations compete with national mythologies that derogate Indians as “savages” and justify land acquisition through discovery. The newly formed states were conscious of their need to deal with Native nations as sovereign political entities.25 Nonetheless, as decades passed and treaties continued to be made, national mythologies of conquest, at times, overrode earlier discourses that recognized Native sovereignty because it supported the sovereignty of the young states.

#### 3] Extinction impacts are fabricated by the settler death drive. Settlers have a psychological investment in imagining the end of the world to create a sense of white vulnerability at the expense of enacting decolonization. You should presume the aff to be false

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Settlers love to contemplate the possibility of their own extinction; to read many contemporary literary representations of settler colonialism is to find settlers strangely satisfied in dreaming of ends that never come. This tendency is widely prevalent in English-language representations of settler colonialism produced since the 1980s: the possibility of an ending – the likelihood that the settler race will one day die out – is a common theme in literary and pop culture considerations of colonialism’s future. Yet it has barely been remarked how surprising it is that this theme is so present. For settlers, of all people, to obsessively ruminate on their own finitude is counterintuitive, for few modern social for- mations have been more resistant to change than settler colonialism. With a few excep- tions (French Algeria being the largest), the settler societies established in the last 300 years in the Americas, Australasia, and Southern Africa have all retained the basic features that define them as settler states – namely, the structural privileging of settlers at the expense of indigenous peoples, and the normalization of whiteness as the marker of pol- itical agency and rights – and they have done so notwithstanding the sustained resistance¶ that has been mounted whenever such an order has been built. Settlers think all the time that they might one day end, even though (perhaps because) that ending seems unlikely ever to happen. The significance of this paradox for settler-colonial literature is the subject of this article.¶ Considering the problem of futurity offers a useful foil to traditional analyses of settler- colonial narrative, which typically examine settlers’ attitudes towards history in order to highlight a constitutive anxiety about the past – about origins. Settler colonialism, the argument goes, has a problem with historical narration that arises from a contradiction in its founding mythology. In Stephen Turner’s formulation, the settler subject is by definition one who comes from elsewhere but who strives to make this place home. The settlement narrative must explain how this gap – which is at once geographical, historical, and existential – has been bridged, and the settler transformed from outsider into indigene. Yet the transformation must remain constitutively incomplete, because the desire to be at home necessarily invokes the spectre of the native, whose existence (which cannot be disavowed completely because it is needed to define the settler’s difference, superior- ity, and hence claim to the land) inscribes the settler’s foreignness, thus reinstating the gap between settler and colony that the narrative was meant to efface.1 Settler-colonial narrative is thus shaped around its need to erase and evoke the native, to make the indigene both invisible and present in a contradictory pattern that prevents settlers from ever moving on from the moment of colonization.2 As evidence of this constitutive contradiction, critics have identified in settler-colonial discourse symptoms of psychic distress such as disavowal, inversion, and repression.3 Indeed, the frozen temporality of settler-colonial narrative, fixated on the moment of the frontier, recalls nothing so much as Freud’s description of the ‘repetition compulsion’ attending trauma.4 As Lorenzo Veracini puts it, because:¶ ‘settler society’ can thus be seen as a fantasy where a perception of a constant struggle is juxtaposed against an ideal of ‘peace’ that can never be reached, settler projects embrace and reject violence at the same time. The settler colonial situation is thus a circumstance where the tension between contradictory impulses produces long-lasting psychic conflicts and a number of associated psychopathologies.5¶ Current scholarship has thus focused primarily on settler-colonial narrative’s view of the past, asking how such a contradictory and troubled relationship to history might affect present-day ideological formations. Critics have rarely considered what such narratological tensions might produce when the settler gaze is turned to the future. Few social formations are more stubbornly resistant to change than settlement, suggesting that a future beyond settler colonialism might be simply unthinkable. Veracini, indeed, suggests that settler-colonial narrative can never contemplate an ending: that settler decolonization is inconceivable because settlers lack the metaphorical tools to imagine their own demise.6 This article outlines why I partly disagree with that view. I argue that the narratological paradox that defines settler-colonial narrative does make the future a problematic object of contemplation. But that does not make settler decolonization unthinkable per se; as I will show, settlers do often try to imagine their demise – but they do so in a way that reasserts the paradoxes of their founding ideology, with the result that the radical potentiality of decolonization is undone even as it is invoked.¶ I argue that, notwithstanding Veracini’s analysis, there is a metaphor via which the end of settler colonialism unspools – the quasi-biological concept of extinction, which, when deployed as a narrative trope, offers settlers a chance to consider and disavow their demise, just as they consider and then disavow the violence of their origins. This article traces the importance of the trope of extinction for contemporary settler-colonial litera- ture, with a focus on South Africa, Canada, and Australia. It explores variations in how the death of settler colonialism is conceptualized, drawing a distinction between his- torio-civilizational narratives of the rise and fall of empires, and a species-oriented notion of extinction that draws force from public anxiety about climate change – an invocation that adds another level of ambivalence by drawing on ‘rational’ fears for the future (because climate change may well render the planet uninhabitable to humans) in order to narrativize a form of social death that, strictly speaking, belongs to a different order of knowledge altogether. As such, my analysis is intended to draw the attention of settler- colonial studies toward futurity and the ambivalence of settler paranoia, while highlighting a potential point of cross-fertilization between settler-colonial and eco-critical approaches to contemporary literature.¶ That ‘extinction’ should be a key word in the settler-colonial lexicon is no surprise. In Patrick Wolfe’s phrase,7 settler colonialism is predicated on a ‘logic of elimination’ that tends towards the extermination – by one means or another – of indigenous peoples.8 This logic is apparent in archetypal settler narratives like James Fenimore Cooper’s The Last of the Mohicans (1826), a historical novel whose very title blends the melancholia and triumph that demarcate settlers’ affective responses to the supposed inevitability of indigenous extinction. Concepts like ‘stadial development’ – by which societies progress through stages, progressively eliminating earlier social forms – and ‘fatal impact’ – which names the biological inevitability of strong peoples supplanting weak – all contribute to the notion that settler colonialism is a kind of ‘ecological process’ that necessitates the extinction of inferior races. What is surprising, though, is how often the trope of extinction also appears with reference to settlers themselves; it makes sense for settlers to narrate how their presence entails others’ destruction, but it is less clear why their attempts to imagine futures should presume extinction to be their own logical end as well.¶ The idea appears repeatedly in English-language literary treatments of settler colonial- ism. Consider, for instance, the following rumination on the future of South African settler society, from Olive Schreiner’s 1883 Story of an African Farm:¶ It was one of them, one of those wild old Bushmen, that painted those pictures there. He did not know why he painted but he wanted to make something, so he made these. [...] Now the Boers have shot them all, so that we never see a yellow face peeping out among the stones. [...] And the wild bucks have gone, and those days, and we are here. But we will be gone soon, and only the stones will lie on, looking at everything like they look now.10¶ In this example, the narrating settler character, Waldo, recognizes prior indigenous inha- bitation but his knowledge comes freighted with an expected sense of biological super- iority, made apparent by his description of the ‘Bushman’s’ ‘yellow face’, and lack of mental self-awareness. What is not clear is why Waldo’s contemplation of colonial geno- cide should turn immediately to the assumption that a similar fate awaits his people as well. A similar presumption of racial vulnerability permeates other late nineteenth- century novels from the imperial metropole, such as Dracula and War of the Worlds,¶ which are plotted around the prospect of invasions that would see the extinction of British imperialism, and, in the process, the human species.¶ Such anxieties draw energy from a pattern of settler defensiveness that can be observed across numerous settler-colonial contexts. Marilyn Lake’s and Henry Reynold’s account of the emergence of transnational ‘whiteness’ highlights the paradoxical fact that while white male settlers have been arguably the most privileged class in history, they have routinely perceived themselves to be ‘under siege’, threatened with destruction to the extent that their very identity of ‘whiteness was born in the apprehension of immi- nent loss’.11 The fear of looming annihilation serves a powerful ideological function in settler communities, working to foster racial solidarity, suppress dissent, and legitimate violence against indigenous populations who, by any objective measure, are far more at risk of extermination than the settlers who fear them. Ann Curthoys and Dirk Moses have traced this pattern in Australia and Israel-Palestine, respectively.12 This scholarship suggests that narratives of settler extinction are acts of ideological mystification, obscuring the brutal inequalities of the frontier behind a mask of white vulnerability – an argument with which I sympathize. However, this article shows how there is more to settler-colonial extinction narratives than bad faith. I argue that we need a more nuanced understanding of how they encode a specifically settler-colonial framework for imagining the future, one that has implications for how we understand contemporary literatures from settler societies, and which allows us to see extinction as a genuine, if flawed, attempt to envisage social change.¶ In the remainder of this paper I consider extinction’s function as a metaphor of decolonization. I use this phrase to invoke, without completely endorsing, Tuck and Yang’s argu- ment that to treat decolonization figuratively, as I argue extinction narratives do, is necessarily to preclude radical change, creating opportunities for settler ‘moves to innocence’ that re-legitimate racial inequality.13 The counterview to this pessimistic perspec- tive is offered by Veracini, who suggests that progressive change to settler-colonial relationships will only happen if narratives can be found that make decolonization think- able.14 This article enters the debate between these two perspectives by asking what it means for settler writers to imagine the future via the trope of extinction. Does extinction offer a meaningful way to think about ending settler colonialism, or does it re-activate settler-colonial patterns of thought that allow exclusionary social structures to persist?¶ I explore this question with reference to examples of contemporary literary treatments of extinction from select English-speaking settler-colonial contexts: South Africa, Australia, and Canada.15 The next section of this article traces key elements of extinction narrative in a range of settler-colonial texts, while the section that follows offers a detailed reading of one of the best examples of a sustained literary exploration of human finitude, Margaret Atwood’s Maddaddam trilogy (2003–2013). I advance four specific arguments. First, extinc- tion narratives take at least two forms depending on whether the ‘end’ of settler society is framed primarily in historical-civilizational terms or in a stronger, biological sense; the key question is whether the ‘thing’ that is going extinct is a society or a species. Second, biologically oriented extinction narratives rely on a more or less conscious slippage between ‘the settler’ and ‘the human’. Third, this slippage is ideologically ambivalent: on the one hand, it contains a radical charge that invokes environmentalist discourse and climate-change anxiety to imagine social forms that re-write settler-colonial dynamics; on the other, it replicates a core aspect of imperialist ideology by normalizing whiteness as¶ equivalent to humanity. Fourth, these ideological effects are mediated by gender, insofar as extinction narratives invoke issues of biological reproduction, community protection, and violence that function to differentiate and reify masculine and feminine roles in the putative de-colonial future. Overall, my central claim is that extinction is a core trope through which settler futurity emerges, one with crucial narrative and ideological effects that shape much of the contemporary literature emerging from white colonial settings.

#### 4] Settler colonialism is the permeating structure of the nation-state which requires the elimination of indigenous life and land via the occupation of settlers. The appropriation of land turns Natives into ghosts and chattel slaves into excess labor.

Tuck and Yang 12

(Eve Tuck, Unangax, State University of New York at New Paltz K. Wayne Yang University of California, San Diego, Decolonization is not a metaphor, Decolonization: Indigeneity, Education & Society Vol. 1, No. 1, 2012, pp. 1-40, JKS)

Our intention in this descriptive exercise is not be exhaustive, or even inarguable; instead, we wish to emphasize that (a) decolonization will take a different shape in each of these contexts - though they can overlap - and that (b) neither external nor internal colonialism adequately describe the form of colonialism which operates in the United States or other nation-states in which the colonizer comes to stay. Settler colonialism operates through internal/external colonial modes simultaneously because there is no spatial separation between metropole and colony. For example, in the United States, many Indigenous peoples have been forcibly removed from their homelands onto reservations, indentured, and abducted into state custody, signaling the form of colonization as simultaneously internal (via boarding schools and other biopolitical modes of control) and external (via uranium mining on Indigenous land in the US Southwest and oil extraction on Indigenous land in Alaska) with a frontier (the US military still nicknames all enemy territory “Indian Country”). The horizons of the settler colonial nation-state are total and require a mode of total appropriation of Indigenous life and land, rather than the selective expropriation of profit-producing fragments. Settler colonialism is different from other forms of colonialism in that settlers come with the intention of making a new home on the land, a homemaking that insists on settler sovereignty over all things in their new domain. Thus, relying solely on postcolonial literatures or theories of coloniality that ignore settler colonialism will not help to envision the shape that decolonization must take in settler colonial contexts. Within settler colonialism, the most important concern is land/water/air/subterranean earth (land, for shorthand, in this article.) Land is what is most valuable, contested, required. This is both because the settlers make Indigenous land their new home and source of capital, and also because the disruption of Indigenous relationships to land represents a profound epistemic, ontological, cosmological violence. This violence is not temporally contained in the arrival of the settler but is reasserted each day of occupation. This is why Patrick Wolfe (1999) emphasizes that settler colonialism is a structure and not an event. In the process of settler colonialism, land is remade into property and human relationships to land are restricted to the relationship of the owner to his property. Epistemological, ontological, and cosmological relationships to land are interred, indeed made pre-modern and backward. Made savage. In order for the settlers to make a place their home, they must destroy and disappear the Indigenous peoples that live there. Indigenous peoples are those who have creation stories, not colonization stories, about how we/they came to be in a particular place - indeed how we/they came to be a place. Our/their relationships to land comprise our/their epistemologies, ontologies, and cosmologies. For the settlers, Indigenous peoples are in the way and, in the destruction of Indigenous peoples, Indigenous communities, and over time and through law and policy, Indigenous peoples’ claims to land under settler regimes, land is recast as property and as a resource. Indigenous peoples must be erased, must be made into ghosts (Tuck and Ree, forthcoming). At the same time, settler colonialism involves the subjugation and forced labor of chattel slaves, whose bodies and lives become the property, and who are kept landless. Slavery in settler colonial contexts is distinct from other forms of indenture whereby excess labor is extracted from persons. First, chattels are commodities of labor and therefore it is the slave’s person that is the excess. Second, unlike workers who may aspire to own land, the slave’s very presence on the land is already an excess that must be dis-located. Thus, the slave is a desirable commodity but the person underneath is imprisonable, punishable, and murderable. The violence of keeping/killing the chattel slave makes them deathlike monsters in the settler imagination; they are reconfigured/disfigured as the threat, the razor’s edge of safety and terror. The settler, if known by his actions and how he justifies them, sees himself as holding dominion over the earth and its flora and fauna, as the anthropocentric normal, and as more developed, more human, more deserving than other groups or species. The settler is making a new "home" and that home is rooted in a homesteading worldview where the wild land and wild people were made for his benefit. He can only make his identity as a settler by making the land produce, and produce excessively, because "civilization" is defined as production in excess of the "natural" world (i.e. in excess of the sustainable production already present in the Indigenous world). In order for excess production, he needs excess labor, which he cannot provide himself. The chattel slave serves as that excess labor, labor that can never be paid because payment would have to be in the form of property (land). The settler's wealth is land, or a fungible version of it, and so payment for labor is impossible.6 The settler positions himself as both superior and normal; the settler is natural, whereas the Indigenous inhabitant and the chattel slave are unnatural, even supernatural. Settlers are not immigrants. Immigrants are beholden to the Indigenous laws and epistemologies of the lands they migrate to. Settlers become the law, supplanting Indigenous laws and epistemologies. Therefore, settler nations are not immigrant nations (See also A.J. Barker, 2009). Not unique, the United States, as a settler colonial nation-state, also operates as an empire - utilizing external forms and internal forms of colonization simultaneous to the settler colonial project. This means, and this is perplexing to some, that dispossessed people are brought onto seized Indigenous land through other colonial projects. Other colonial projects include enslavement, as discussed, but also military recruitment, low-wage and high-wage labor recruitment (such as agricultural workers and overseas-trained engineers), and displacement/migration (such as the coerced immigration from nations torn by U.S. wars or devastated by U.S. economic policy). In this set of settler colonial relations, colonial subjects who are displaced by external colonialism, as well as racialized and minoritized by internal colonialism, still occupy and settle stolen Indigenous land. Settlers are diverse, not just of white European descent, and include people of color, even from other colonial contexts. This tightly wound set of conditions and racialized, globalized relations exponentially complicates what is meant by decolonization, and by solidarity, against settler colonial forces. Decolonization in exploitative colonial situations could involve the seizing of imperial wealth by the postcolonial subject. In settler colonial situations, seizing imperial wealth is inextricably tied to settlement and re-invasion. Likewise, the promise of integration and civil rights is predicated on securing a share of a settler-appropriated wealth (as well as expropriated ‘third-world’ wealth). Decolonization in a settler context is fraught because empire, settlement, and internal colony have no spatial separation. Each of these features of settler colonialism in the US context - empire, settlement, and internal colony - make it a site of contradictory decolonial desires7. Decolonization as metaphor allows people to equivocate these contradictory decolonial desires because it turns decolonization into an empty signifier to be filled by any track towards liberation. In reality, the tracks walk all over land/people in settler contexts. Though the details are not fixed or agreed upon, in our view, decolonization in the settler colonial context must involve the repatriation of land simultaneous to the recognition of how land and relations to land have always already been differently understood and enacted; that is, all of the land, and not just symbolically. This is precisely why decolonization is necessarily unsettling, especially across lines of solidarity. “Decolonization never takes place unnoticed” (Fanon, 1963, p. 36). Settler colonialism and its decolonization implicates and unsettles everyone.

#### 5] This debate is not private space good/bad, but instead a question of Native sovereignty and the power to invoke the plan. The 1AC eclipses the authority of Native nations, so in response we affirm the long tradition of Indigenous internationalism across colonial borders.

Estes 19

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The Treaty Council, however, was not the first or only version of what historian Daniel Cobb calls a “global Indigenous identity.” Rather, it belonged to and drew from a long tradition of Indigenous internationalism.5 Prior to European contact, Indigenous nations had often entered into relations with each other for alliance, kinship, war, peace, or trade. As shown in previous chapters, agreements were made not solely between human nations, but also among nonhuman nations as well, such as the buffalo and the land. Such treaties were, and continue to be, the basis of diplomacy and the evidence of a prior and continuing status of Indigenous nationhood. Sovereign nations do not enter into international relations or treaties with domestic or “internal” populations. On the contrary, the very basis of sovereignty is the power to negotiate relationships between those who are seen as different— between other sovereigns and nations. But concepts of “sovereignty” and “nation” possess different meanings for Indigenous peoples than for their European-derived counterparts. And they are not entirely consistent, either, with the aspirations for a nation-state that came to define decolonization movements in the Third World. While doing important defensive work, on face value these Western and Third World concepts only partially reflect traditions of Indigenous resistance. Far beyond the project of seeking equality within the colonial state, the tradition of radical Indigenous internationalism imagined a world altogether free of colonial hierarchies of race, class, and nation. This vision allowed revolutionary Indigenous organizations such as the Treaty Council to make relatives, so to speak, with those they saw as different, imagining themselves as part of Third World struggles and ideologies, and entirely renouncing the imperialism and exceptionalism of the First World (while still living in it). They were in the First World but not of it—much like American Indians are in, but not entirely of, the United States. Indigenous peoples across North America and the world have fought, died, and struggled to reclaim, restore, and redefine these powerful ideas. Their goal has been to take their proper place in the family of nations. Radical Indigenous internationalism, however, predates AIM and the Treaty Council. Contemporary pan-Indigenous movements were a result of more than a decade of Red Power organizing that began in the early 1960s, nearly a decade before the creation of AIM. Earlier, in the 1950s, Flathead scholar and writer D’Arcy McNickle and the National Congress of American Indians had explored a similar intellectual and political terrain of internationalism. And before that, the Society of American Indians advocated for a seat at the table during the 1919 Paris peace talks and representation at the League of Nations. Each distinct instance posed a similar question: If Indigenous peoples are nations, why are they not afforded the right to self-determination? Two strands of thinking about self-determination for the colonial world prevailed following the First World War. In the first, US President Woodrow Wilson argued for self-determination with a limited set of rights that would not radically upset the colonial order. Such liberal internationalism, however, glaringly omitted Indigenous peoples, as they understood themselves as nations that existed prior to the formation of settler states. Rarely were Wilson’s principles applied to North America or the United States; nor were they ever intended to extend to Indigenous peoples. A second, more radical vision put forward by Communist revolutionary V. I. Lenin argued for the right of colonized nations to secede and declare independence from their colonial masters. This view was echoed by the Third World decolonization movement, as part of a global Socialist and Communist revolution, and it has frequently been applied in the Asian, African, and South American contexts. But this view remained almost entirely absent in North America, except among radical Indigenous, Black, Asian, Caribbean, and Chicanx national liberation movements. The Treaty Council advocated Indigenous nationhood as part of this global anti-colonial movement and in line with Third World liberation movements. After decades of experiencing land loss, enduring bare survival, attempting to work with federal programs, filing court cases, defeating termination legislation, and facing mass relocation, an assertion of Oceti Sakowin sovereignty went from ambition to prescription. Few avenues remained other than the pursuit of international treaty rights. Treaties made with the United States were proof of nationhood. But what legal institution would uphold this position if the United States refused to? If the goal was to reverse the unjust occupation of an entire continent, the advancement of Indigenous rights through the very legal and political systems that justified that occupation in the first place had proven limited in some instances, and hopeless in others. To survive, AIM and the Treaty Council therefore had to look elsewhere to make their case—beyond the confines of the most powerful political construct in world history, the nation-state. Prior to and during colonization, Indigenous nations had self-organized into deliberate confederacies, alliances, and governments. The Nation of the Seven Council Fires (the Oceti Sakowin), for instance, is a confederacy of seven different nations of Lakota-, Dakota-, and Nakota-speaking peoples in the Northern Plains and Western Great Lakes. They are hardly unique; in North America alone there are the Creek Confederacy in the Southeast, the Haudenosaunee Confederacy of Six Nations in the Northeast, the Council of Three Fires (made up of Ojibwes, Odawas, and Potawatomis) in the Great Lakes region, the United Indian Nations in the Ohio River valley (under the Shawnee leadership of Tecumseh), the All Indian Pueblo Council of the Southwest, and the Iron Confederacy of the Northern Plains. Many other political confederacies also flourished prior to, alongside, and in spite of settler states in North America. And their legacies are hardly relegated to the primordial past. Modern Oceti Sakowin internationalism, for instance, traces its origins to the early twentieth century, an era generally viewed as a low point for Indigenous activism and resistance. In North America alone, an estimated precolonial population of tens of millions of Indigenous peoples had been reduced to about 300,000, and for Flathead historian D’Arcy McNickle, writing in 1949, two processes contributed greatly to this decimation: the institution of private property and the destruction of Indigenous governance that once held land in common. Indigenous nations at the time also possessed little in the way of either collective property or political power, as Indigenous territory had been drastically diminished, and the reservation system had overthrown or almost entirely dissolved customary governments. If Indigenous peoples once constituted the tree of the Americas, whose roots deeply entwined in the land, the cultivation of “growth from the severed stump,” McNickle argued, was the pivotal challenge of the twentieth century.7 Physical extermination and the repression of Indigenous political power verified the United States’ genocidal intent, but these had not accomplished their purpose. And despite otherwise stating pluralistic claims to inclusion, McNickle concluded that the United States simply “can not tolerate a nation within a nation.” If Natives were to be assimilated, they would be assimilated as individuals and not as nations. In the popular imaginary, Natives disappeared into the wilderness of history, were never truly nations, and had been overpowered by a superior civilization. If they were nations, they were eclipsed and replaced by the real nation—the United States. Such erasure notwithstanding, vibrant Indigenous political traditions persisted. But to the untrained eye, nothing was awry. From the severed stump began to regrow the tree of life—the tree of resistance that would blossom into revolt decades later.

#### Counter-Interpretation: The 1AC is an object of research. The role of the neg should be to disprove the various meanings of that object. Plan focus restricts the debate to a ten second statement and leaves the rest of the aff unquestioned. They should be responsible for the way their knowledge is constructed and used because that produces the best model for activism and ethics in the context of the topic which is a unique education net benefit to our interpretation

#### -They get to weigh their aff’s research and the reasons why that research is desirable, which resolves any fairness concerns

#### -All of our links implicate the effects of the plan, which is sufficient for plan focus

#### 6] The process and agents of political change matter. Indigenous internationalism must be asserted through Native sovereignty and organizing. The plan and the perm still collude with settlerism, which trades-off with meaningful resistance.

Simpson 16

(Leanne Betasamosake Simpson, renowned Michi Saagiig Nishnaabeg scholar. She holds a PhD from the University of Manitoba, and teaches at the Dechinta Centre for Research & Learning in Denendeh. An Interview with Eve Tuck (Unangax̂), Indigenous Resurgence and Co-resistance, Critical Ethnic Studies, Vol. 2, No. 2 (Fall 2016), pp. 19-34, JKS)

PLACE-BASED INTERNATIONALISM

Eve: One idea that Wayne and I floated in our call for papers is that how a person or community understands the roots or source of injustice will have implications for how they go about undoing that injustice. Does this make sense to you? Might it be too simplistic or problematic?

Leanne: I think we need to be a bit careful here, particularly in the academy. I think Indigenous peoples understand pretty well injustice in their own lives whether or not they can articulate it using the language of colonialism or decolonization. I think movements that link social realities with political systems and focus on creating real-world-on-the-ground alternatives are powerful. I worry that too much of our energy goes into trying to influence the system rather than creating the alternatives. It matters to me how change is achieved. Change achieved through struggle, organizing, and creating the alternatives produces profoundly different outcomes than change achieved through recognition-focused protest, and pressuring the state to make the changes for us. That is a recipe for co-option. I think it is important to understand root causes of injustice, but it is also important to understand think strategically and intelligently about approaches to undoing that injustice. I think that diagnosis and strategic action must be done within grounded normativity. Indigenous thought has a tradition of place-based internationalism that I think is this beautifully fertile spot because it links place-based thinking and struggle with the same decolonial pockets of thinking throughout the world. Nishnaa- beg have been linking ourselves to the rest of the world since the beginning of time, and throughout our resistance to colonialism we have our people traveling throughout the world to link with other communities of resistors. Grassy Narrows First Nation comes to mind in their nearly four- decade fight against mercury poisoning in their river system and the relationship they have made with the Japanese community in Mnimata.6 We need to use our experiences in the past to think critically about how we respond to injustice today. Right now, Indigenous peoples in Canada need to be thinking critically about the implications of seeking recogni- tion within the colonial state because we have a government that is very good at neoliberalism and seducing our hope for their purposes. Again, Glen Sean Coulthard, in Red Skin, White Masks, using the Dene nation’s experience in the 1970s, provides a blistering critique of the pitfalls of seeking political recognition within state structures. He makes the point that continually seeking recognition with the settler-colonial state is a process of co-option and neutralization, and is a way of bringing Indigenous peoples into the systems that guts our resistance movements, for instance, and we get very little in return.7 In fact, in terms of dispossession—that is, the removal, murdering, displacement, and destruction of the relation- ship between Indigenous bodies and Indigenous land—this serves only to facilitate land loss, not improve things. Engagement with the system changes Indigenous peoples more than it changes the system. This can be destructive in terms of resurgence because resurgent movements are trying to do the opposite—we are trying to center Indigenous practices and thoughts in our lives as everyday acts of resistance, and grow those actions and processes into a mass mobilization. I think it is useful to apply this same critique of recognition to orga- nizing and mobilizing with the purpose of making a switch from mobi- lizing around victim-based narratives—that is, publically demonstrating the pain of loss as a mechanism to appeal to the moral and ethical fabric of Canadian society (which has over and over again proven to be morally bankrupt when it comes to Indigenous peoples)—to using that same pain and anger to fuel resurgent actions. This organizing from within grounded normativity has always fueled Indigenous resistance and continues to happen all the time in Indigenous communities—it is just often misread by others. The community of Hollow Water First Nation created the Community Holistic Circle of Healing as a Nishnaabeg restoration of relationships, or a restorative justice model to address sexual violence in their community.8 Christi Belcourt’s Walking with Our Sisters exhibit has created a traveling display of 1,800 moccasin vamps as a way of honoring and commemorating missing and murdered Indigenous women and children in Canada and the United States. The exhibit does not rely on state funding.9 Thousands of volunteers made the vamps. The exhibit works with local communities and their cultural and spiritual practices to install the exhibit and do the necessary ceremony and community processes. Walking with Our Sisters works with local organizers a year in advance of installation, using Indigenous processes to embed the art in community on the terms of the local community. There is also the work of countless urban Indigenous organizations supporting the families of MMIWG2S people. The Native Youth Sexual Health Network provides on-the-ground, community-embedded, peer-to-peer support around sex- ual health and addiction for youth.10 The Akwesasne Freedom School provides Mohawk education for Mohawk children.11 The Iroquois national and Haudenosaunee women’s lacrosse teams travel using Haudenosau- nee passports instead of American or Canadian ones.12 The Unist’ot’en Camp pursues land protection resurgent action and the reclamation of the original name of Mount Douglas, PKOLS, in the city of Victoria, British Columbia.13

## Case

### Solvency

#### Even though the OST doesn’t bind private entities, governments still already restrict and regulate them to ensure just compliance in the squo

Eijk 20 [Cristian van Eijk is finishing an accelerated BA in Law at the University of Cambridge. He holds a BA cum laude in International Justice and an LLM in Public International Law from Leiden University, and has previously worked at the T.M.C. Asser Institute and the International Commission on Missing Persons. “Sorry, Elon: Mars is not a legal vacuum – and it’s not yours, either.” Voelkerrechtsblog. May 11, 2020. <https://voelkerrechtsblog.org/sorry-elon-mars-is-not-a-legal-vacuum-and-its-not-yours-either/>] HW AL

Two provisions of the Outer Space Treaty (OST), both also customary, are particularly relevant here. OST article II: “Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” OST article III: “States… shall carry on activities in the exploration and use of outer space, including (…) celestial bodies, in accordance with international law”. SpaceX is a private entity, and is not bound by the Outer Space Treaty – but that does not mean it can opt out. Its actions in space could have consequences for the United States in three ways. First, the US, as SpaceX’s launch state, bears fault-based liability for injury or damage SpaceX’s space objects cause to other states’ persons or property (OST article VII, Liability Convention articles I, III). Second, the US, as SpaceX’s state of registry, is the sole state that retains jurisdiction and control over SpaceX objects (OST article VIII, Registration Convention article II). Both refer to objects in space and are irrelevant. According to article VI OST, States “bear international responsibility for national activities in outer space”, including Mars, including those by “non-governmental entities”. The US, as SpaceX’s state of incorporation, must authorise and continuously supervise SpaceX’s actions in space to ensure compliance with the OST (OST article VI) and international law (OST article III). In practice, this task is done by the US Federal Communications Commission, which licenses and regulates SpaceX. Article VI OST sets a specific rule of attribution, supplementing the customary rules of state responsibility (Stubbe 2017, pp. 85-104). SpaceX acts with US authorisation, and its conduct in space within and beyond that authorisation is attributable to the US (ARSIWA articles 5, 7). In the absence of circumstances precluding wrongfulness, the result is straightforward. If SpaceX breaches a US obligation under international law, the US bears responsibility for an internationally wrongful act.

#### Space law will be near impossible to enforce—numerous jurisdictional issues on other planets.

Gohd 19

Chelsea Gohd, senior writer, worked for American Museum of Natural History, Scientific American, Discover Magazine Blog, Astronomy Magazine and Live Science, 8-29-2019, "Who Investigates a Crime in Space?," Space.com, https://www.space.com/who-investigates-space-crime.html //MLT

As human spaceflight advances to Mars or to long-duration lunar settlements, legal issues will be more likely to arise again in space. At that point, the already-murky waters of addressing space crime will become even less clear. It is possible, then, that as we venture out farther into the solar system for longer periods, we will need to further develop regulations and guidelines surrounding criminal jurisdiction in space. For a lunar or Martian colony, criminal jurisdiction would at first "use what we currently have as the baseline," von der Dunk said. So a U.S. astronaut flying to Mars on a U.S. spacecraft would be subject to U.S. jurisdiction. But things would get more complicated as more people came to the moon or Mars and humans began spending more time on these bodies. For example, if a person flies to the moon, "step[s] out of the lunar module, send[s] it back and stay[s] for four years longer on the moon, they are no longer personnel on the spacecraft," von der Dunk said. So, while such an individual would have been considered under U.S. jurisdiction because they flew aboard an U.S. vehicle, would this still apply once they no longer worked or lived on that craft? Additionally, "space law has a peculiar twist, because this jurisdiction applies to space objects, and space objects are seen as something launched by humans into outer space," von der Dunk said. So, if humans manufacture homes out of local material on the moon or Mars, would jurisdiction change because astronauts would no longer be in a habitat or craft from an Earth nation?

### Mining

#### We’re still lightyears away from lunar mining — even Elon acknowledges the immense difficulties that we’re nowhere near solving

Mining Technology 17

Mining Technology (mining news and in-depth feature articles on the latest mining company deals and projects covering trends in mineral exploration); “Mining the Moon”; *Mining Technology*; December 4, 2017; <https://www.mining-technology.com/features/mining-the-moon/>; HW-EMJ

The concept of mining on the Moon has been around for decades, and while political and scientific endeavour has ebbed and flowed, it has never gone away. Almost all current space exploration programmes – American plans to go back to the Moon and Elon Musk’s SpaceX programme included – factor in mining resources in some way or another. “The basic idea is to extract materials from the Moon that create new capabilities in space,” says lunar scientist Paul Spudis. “To this end, people have envisioned a wide variety of mining and resource utilisation activities on the Moon. Broadly, most plans involve the collection of granular material, running it through some type of processing, e.g. thermal, chemical – the extraction of useful stuff and the discarding of the waste.” Scientific advances are bringing commercial space travel ever closer. At the same time, terrestrial resources are beginning to wane and dreams of making use of the 7.3 x 1022kg of material circling the Earth that make up the Moon have gained greater traction. So, realistically, how close are we to mining the Moon? Water, metals and REMs The Moon’s resources could be put to a number of uses, such as a source of fuel for farther flung journeys through space, or providing an alternate source of rare metals and minerals for use on Earth. “There is a hierarchy of material resources, arranged according to their ease of acquisition and their utility,” says Spudis. “The easiest stuff is bulk regolith (lunar soil), which can be used to backfill installations on the moon and to make shielding to protect habitats thermally and from radiation.” Regolith would not be transported to Earth, but for missions such as SpaceX’s, which include building a lunar base, it could be very beneficial. When, in 2008, samples from the 1970s Apollo 15 and 17 missions were re-examined, the presence of water brought greater hope of establishing lunar habitations. Since then, multiple studies have confirmed that the Moon has water in abundance. “Water ice (and other volatile substances) is found in the dark areas near the poles and have many uses, including life support and rocket propellant,” says Spudis. For any future mining activities water will be necessary, both for operations and for sustaining a crew. “Water is the oil of the solar system and those companies who are able to harvest and harness extraterrestrial deposits of water will make Exxon look like a lemonade stand,” says founder and CEO of Moon Express, Robert Richards. Along with water, the Moon has a number of other materials which would be useful for space exploration. “Metals can be extracted from the oxides in the soil by chemical reduction – iron, titanium and aluminium are the principal useful metals to be manufactured on the Moon,” says Spudis. But like regolith, it wouldn’t be profitable to bring these metals back to Earth where they can be mined far more easily. Currently, China produces more than 90% of the rare earth metals (REM) we need for electronics. But reserves are running out fast with some elements, including dysprosium, neodymium and lanthanum, expected to be depleted within the next 20 years. In order to feed the world’s seemingly insatiable appetite for technology, new sources of REMs must be found, as recycling alone will be unable to meet demand. “Rare and unusual elements and isotopes (rare earths, thorium, helium-3) may be accessed and mined,” says Spudis. “Some of these uncommon materials may be of such high value as to merit their importation back to Earth for sale in terrestrial markets. But these are in very low concentrations and will likely be the targets for mining in the future, after a long-term presence on the Moon has been established.” It is these which provide the greatest hope for profitable mining companies and shipping to Earth. There and back again Many hurdles remain before mining the Moon can happen, not least getting there. In all of human history only 12 people have ever walked on the Moon. This is, in part, due to the colossal expense of such a venture, so the cost must come down before industry can proceed. Conventional thinking is to create reusable rockets, something SpaceX is currently working on with its Dragon craft. “If one can figure out how to effectively reuse rockets just like airplanes, the cost of access to space will be reduced by as much as a factor of a hundred,” says SpaceX founder and CEO Elon Musk. “A fully reusable vehicle has never been done before. That really is the fundamental breakthrough needed to revolutionise access to space.” Once commercially affordable lunar transport has been developed and the Moon reached, then the challenges intensify. Crews working in the hostile environment of the Moon will have to endure living in “a vacuum with extremes of heat and cold, hard radiation and the ubiquitous presence of abrasive, angular dust grains”, explains Spudis. The temperature on the Moon varies from 123°C to -233°C because there is no atmosphere, making human habitation and activities very difficult. Furthermore, there is only about a sixth of the gravity on the Moon that we experience on Earth, complicating mining operations substantially. Bases will need to be established, probably with the use of 3D printing, which would enable the construction of infrastructure on the Moon. Mining lunar material will also require self-sufficient and reliable robotics to minimise human exposure to the Moon’s environment. “Mining machines could be automated for simple tasks and teleoperated for complex tasks requiring human supervision, but complex machines will require self-maintenance, high reliability and long lifetimes,” says Spudis. “The exposure of humans to the harsh environment must be minimised.” Furthermore, raw materials harvested will need to be processed on the Moon. Transferring lunar soil to Earth for processing is simply impractical, and much of the materials would be required for activities taking place on the Moon itself, such as those necessary for building and maintaining the moon base. For elements worth transporting back, there is a third phase of complications: returning to Earth. This particular challenge could be resolved by way of reusable space crafts, which would have to be capable of not only withstanding the immense heat and pressure of re-entering Earth’s atmosphere with enough control to land safely in a specific location, but to do all of this whilst carrying an extremely heavy cargo of REM.

#### Asteroid mining is impractical and no one is going to try any time soon

Fickling 20

David Fickling (columnist covering commodities and industrial and consumer companies, reporter for Bloomberg, Dow Jones, WSJ, Financial Times, Guardian.; “We’re Never Going to Mine the Asteroid Belt”; *Bloomberg News*; December 21, 2020; <https://www.bloomberg.com/opinion/articles/2020-12-21/space-mining-on-asteroids-is-never-going-to-happen>; HW-EMJ

It’s wonderful that people are shooting for the stars — but those who declined to fund the expansive plans of the nascent space mining industry were right about the fundamentals. Space mining won’t get off the ground in any foreseeable future — and you only have to look at the history of civilization to see why. One factor rules out most space mining at the outset: gravity. On one hand, it guarantees that most of the solar system’s best mineral resources are to be found under our feet. Earth is the largest rocky planet orbiting the sun. As a result, the cornucopia of minerals the globe attracted as it coalesced is as rich as will be found this side of Alpha Centauri. Gravity poses a more technical problem, too. Escaping Earth’s gravitational field makes transporting the volumes of material needed in a mining operation hugely expensive. On Falcon Heavy, the large rocket being developed by Elon Musk’s SpaceX, transporting a payload to the orbit of Mars comes to as little as $5,357 per kilogram — a drastic reduction in normal launch costs. Still, at those prices just lofting a single half-ton drilling rig to the asteroid belt would use up the annual exploration budget of a small mining company. Power is another issue. The international space station, with 35,000 square feet of solar arrays, generates up to 120 kilowatts of electricity. That drill would need a similar-sized power plant — and most mining companies operate multiple rigs at a time. Power demands rise drastically once you move from exploration drilling to mining and processing. Bringing material back to Earth would raise the costs even more. Japan’s Hayabusa2 satellite spent six years and 16.4 billion yen ($157 million) recovering a single gram of material from the asteroid Ryugu and returning it to Earth earlier this month. What might you want to mine from space? Water is an essential component of most earth-bound mining operations and a potential raw material for hydrogen-oxygen fuel that could be used in space. The discovery in October of ice molecules in craters on the Moon was taken as a major breakthrough. Still, the concentrations of 100 to 412 parts per million are extraordinarily low by terrestrial standards. Copper, which typically costs about $4,500 per metric ton to refine, has an average ore grade of about 6,000 ppm. The more promising commodities are platinum, palladium, gold and a handful of rare related metals. Because of their affinity for iron, these so-called siderophile elements mostly sunk toward the metallic core of our planet early in its formation, and are relatively scarce in the Earth’s crust. Estimates of their abundance on some asteroids, such as the enigmatic Psyche 16 beyond the orbit of Mars, suggest concentrations several times higher than can be found in terrestrial mines. Still, human ingenuity is all about cutting our coat according to our cloth. If such platinum-group metals are going to justify the literally astronomical costs of space mining, they’ll need to count on sustained high prices for the decade or so that would be needed to get such an operation up and running — and that sort of situation is all but unheard-of in the materials industry. When prices of an essential commodity get excessively high, chemists get extraordinarily good at finding ways to avoid using it, scrap merchants improve their recycling rates, and miners discover new deposits that wouldn’t have been viable at lower prices. Even criminals get in on the game. That eventually pushes supply up and demand down, so that prices rebalance — a dynamic we’ve seen play out in the markets for rare earths, lithium and cobalt in recent years. The world mines about three times more platinum than it did in the early 1970s, but prices have barely changed once adjusted for inflation. That might sound a disappointing prospect to those looking for excuses for humanity to colonize space — but really it should be seen as a tribute to our ingenuity. Humanity’s failure to exploit extraterrestrial ore reserves isn’t a sign that we lack imagination. If anything, it’s a sign of the adaptive genius that put us in orbit in the first place.

#### Asteroid mining solves water conflict and Kessler syndrome

Tillman 19

Nola Taylor Tillman (contributing writer for space.com, loves astronomy and space, and this article cites an asteroid researcher at Johns Hopkins, it is not Nola’s own analysis), 9-29-2019, "Tons of Water in Asteroids Could Fuel Satellites, Space Exploration," Space, https://www.space.com/water-rich-asteroids-space-exploration-fuel.html, // HW AW

When it comes to mining space for water, the best target may not be the moon: Entrepreneurs' richest options are likely to be [asteroids](https://www.space.com/51-asteroids-formation-discovery-and-exploration.html) that are larger and closer to Earth. A recent study suggested that roughly 1,000 water-rich, or hydrated, asteroids near our planet are easier to reach than the lunar surface is. While most of these space rocks are only a few feet in size, more than 25 of them should be large enough to each provide significant water. Altogether, the [water locked in these asteroids](https://www.space.com/how-much-water-in-asteroids.html) should be enough to fill somewhere around 320,000 Olympics-size swimming pools — significantly more than the amount of water locked up at the lunar poles, the new research suggested. Because asteroids are small, they have less gravity than Earth or the moon do, which makes them easier destinations to land on and lift off from. If engineers can figure out how to mine water from these space rocks, they could produce a source of ready fuel in space that would allow spacecraft designers to build [refuelable models](https://www.space.com/orbit-fab-demonstrates-satellite-refueling-technology-on-iss.html) for the next generation of satellites. Asteroid mining could also fuel human exploration, saving the expense of launching fuel from Earth. In both cases, would-be space-rock miners will need to figure out how to free the water trapped in hydrated minerals on these asteroids. "Most of the hydrated material in the near-Earth population is contained in the largest few hydrated objects," Andrew Rivkin, an asteroid researcher at Johns Hopkins University Applied Physics Research Laboratory in Maryland, told Space.com. Rivkin is the lead author on the paper, which estimated that near Earth asteroids could contain more easily accessible water than the lunar poles. Related: [NASA Wants a New Space Telescope to Protect Us All from Dangerous Asteroids](https://www.space.com/nasa-to-build-near-earth-asteroid-hunter-telescope.html) "A sure thing" According to the United Nations Office for Outer Space Affairs, more than 5,200 of the objects launched into space are still in orbit today. While some continue to function, the bulk of them buzz uselessly over our heads every day. **They carry fuel on board, and when they run out, they are either lowered into destructive orbits or left to become** [**space junk**](https://www.space.com/16518-space-junk.html)**, useless debris with the potential to cause enormous problems for working satellites.** [**Refueling satellites in space**](https://www.space.com/8339-wet-asteroid-space-gas-station.html) **could change that model, replacing it with long-lived, productive orbiters.** "It's easier to bring fuel from asteroids to geosynchronous orbit than from the surface of the Earth," Rivkin said. "If such a supply line could be established, it could make [asteroid mining](https://www.space.com/39363-planetary-resources-asteroid-mining-satellite-launches.html) very profitable." Hunting for space water from the surface of the Earth is challenging because the planet's atmosphere blocks the wavelength of light where water can be observed. The asteroid warming as it draws closer to the sun can also complicate measurements. Instead, Rivkin and his colleagues turned to a class of space rocks called Ch asteroids. Although these asteroids don't directly exhibit a watery fingerprint, they carry the telltale signal of oxidized iron seen only on [asteroids](https://www.space.com/51-asteroids-formation-discovery-and-exploration.html) with signatures of water-rich minerals, which means the authors felt confident assuming that all Ch asteroids carry this rocky water. Based on meteorite falls, a previous study estimated that Ch asteroids could make up nearly 10% of the [near-Earth objects](https://www.space.com/nasa-to-build-near-earth-asteroid-hunter-telescope.html) (NEOs). With this information, the researchers determined that there are between 26 and 80 such objects that are hydrated and larger than 0.62 miles (1 km) across. Right now, only three NEOs have been classified as Ch asteroids, although others have been spotted in the asteroid belt. Most NEOs are discovered and observed at wavelengths too short to reveal the iron band that marks the class. Carbon-rich asteroids, which include Ch asteroids and other flavors, are also darker than the more common stony asteroids, making them more challenging to observe. Although Ch asteroids definitely contain water-rich minerals, that doesn’t necessarily mean that they will always be the best bet for space mining. It comes down to risk. Would an [asteroid-mining](https://www.space.com/moon-asteroid-space-mining-with-concentrated-sunlight.html) company rather visit a smaller asteroid that definitely has a moderate amount of water, or a larger one that could yield a larger payday but could also come up dry? "Whether getting sure things with no false positives, like the Ch asteroids, is more important or if a greater range of possibilities is acceptable with the understanding that some asteroids will be duds is something the miners will have to decide," Rivkin said. Not too big, not too small In addition to estimating the number of large, water-rich asteroids might be available, the study also found that as many as 1,050 smaller objects, roughly 300 feet (100 meters) across, may also linger near Earth. Their small bulk will make them [easier to mine](https://www.space.com/30213-asteroid-mining-planetary-resources-2025.html) because their low gravity will require less fuel to escape from, but they will produce less water overall, and Rivkin expects that the handful of larger space rocks will be the first targets. "It seems likely that the plan for these companies will be to find the largest accessible asteroid with mineable material with the expectation that it will be more cost-effective than chasing down a large number of smaller objects," Rivkin said. "How 'accessible' and 'mineable material' and 'cost-effective' are defined by each company is to be seen." But asteroids will certainly be more accessible than the moon, another [potential source](https://www.space.com/41164-mining-moon-water-plans-take-shape.html) of space-based water-rich minerals. According to Rivkin, landing safely on the lunar surface takes more than a hundred times the change of velocity required to land on an asteroid. Similarly, taking off from the moon means breaking free from its gravity, requiring even more fuel. "Even asteroids that are a bit farther from the Earth than the moon can be reached with less fuel than the lunar surface," Rivkin said.