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#### Narratives of space exploration are shaped by colonialism: progress, adventure, conquest, and extraction all have roots in European colonialism in the global south. Spaceflight emerged from these discourses and from material colonization in equatorial territories like French Guiana. The tropics shape space exploration both representationally and materially, and space exploration is grounded on the colonial exploitation of the tropics. To critique colonialism, we must consider the geographical, political, and social meanings of the tropics in the context of outer space. Thus, the role of the ballot is to center the tropics in cosmic discourse.

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Approaching concepts of outer space, geopolitics and science through Arthur C. Clarke first requires a broader discussion of relevant debates in postcolonial studies, science and technology studies, and historical geography. Synthesising some of these themes, the anthropologist Peter Redfield’s study of the European space programme aimed to ‘recombine elements of imaginative discourse with technical practise, tracing the trajectory of adventure as it leaves the planet, and highlighting the historical geography of power that runs through the Final Frontier’ (Redfield 2002, 792). This empirically rich work provides a sound theoretical basis for exploring the cultural and political roots of spaceflight in the late modern era, while taking seriously imaginative representations of outer space. Existing studies of outer space in this period have mostly examined, by contrast, the social and cultural ‘impacts’ of the better- known American and Soviet / Russian space programmes, in the geopolitical context of the Cold War (Dick and Launius 2007, Parker and Bell 2009). Redfield connects outer space and empire in two ways: Firstly, through analysing the imaginative geographies of exploration, conquest and adventure that have long characterised spaceflight narratives, and second, in examining the colonial status of the European Space Agency launch site in French Guiana in South America, home of the *Ariane* satellite launcher rocket since 1979. Other researchers have considered rocket sites in colonial locations such as Hammaguir in Algeria, launch site of the French satellite *Astérix* in 1965, and Woomera in South Australia, where the British Blue Streak rocket was tested in the 1960s (Gorman 2009, Instone 2010). The development of these sites as centres of imperial techno-science notably came at a time when European empires were disintegrating in spaces across the world, and thereby make effective case studies for examining late-modern connections to the empire of outer space. An integral argument in critical studies of spaceflight is that space exploration represents a modernist dream that acts as a continuation of empire, implicating discourses of technology- as-progress. In this respect, historian Michael Adas has explained how, in the industrial era, science and technology were seen as ‘measures of human worth’, justifying European colonialism while also acting as the means through which imperial power was exercised (Adas 1989, 3). This pattern has been noted in accounts of technological determinism that frequently characterise narratives of space exploration. For example, the American space programme of the 1960s, specifically Project Apollo, is said to have exemplified and helped proliferate ‘technocratic’ modes of governance in the United States, typified by ‘a utopian attitude towards technology’ as a solution to all the world’s problems (Sage 2014, 57). More recently, ‘NewSpace’ magnates such as Elon Musk and Jeff Bezos have enrolled the language of utopian technological futurism to promote ambitious space ventures such as the colonisation of Mars (SpaceX 2018). Such framings have been described as ‘depressingly ubiquitous’ in portrayals of so-called ‘frontier technologies’, adding to debates on the extent to which technology can be seen as culturally and politically produced, rather than naturalised as a harbinger of progress and modernity (Bingham 2005, 202; Jasanoff and Kim 2015). Critics have typically rejected technological determinism as an effective explanation of societal development, drawing on postmodernist accounts that define a role for the social construction of science and technology (Shapin and Schaffer 1985). Indeed, researchers have demonstrated how spaceflight technology did not emerge naturally at any given place or time, with political and cultural factors influencing substantial geographical and historical disparities in its development (Winter 1983). Further studies have effectively outlined how various popular cultures, including science fiction novels, astronomical art and the public spectacle of rocketry, worked as integral parts of the wider discourse of twentieth-century outer space technology (Redfield 2002, Sage 2008, MacDonald 2008). Adding further nuance to debates on the relationship between technology and culture, Redfield explains how a combination of political, cultural and geophysical factors led to the selection of French Guiana as the home of the European Space Agency’s rocket launch facility in the early 1970s (Redfield 2000). Notwithstanding its history as part of the French imperial sphere of influence, French Guiana’s significance for European spaceflight operations lies with its geographical location near to the equator, and its eastward-facing coastline. This is because, firstly, equatorial sites benefit from the maximum ‘latitudinal boost’ resulting from the centrifugal forces of the earth’s rotation, and, second, the Atlantic Ocean is made available as a vast testing range, where spent rockets can safely crash back down into the open seas. Furthermore, the equatorial region becomes prized in the geography of spaceport site selection because of its alignment with the prime ‘real estate’ of the geosynchronous orbit, located along a band in space 36,000 km above the earth’s equator (Collis 2009). As Clarke illustrated in 1945, satellites placed in this orbit attain specific value as they remain fixed above any given point on the earth’s equatorial belt, and can thereby be used for reliable global communications services (Clarke 1945). This new perspective was officially recognised in the 1976 Bogotá Declaration, which stated that ‘[t]he geostationary orbit is a scarce natural resource’, over which equatorial states should have national sovereignty (Bogotá Declaration 1976). While signed by a consortium of equatorial states, the declaration remains unratified by the United Nations, highlighting the unequal power geometries involved in outer space geopolitics. Such concerns demonstrate how the study of space launch sites, both actual and anticipated, presents opportunities for researchers interested in the intersections between science and technology studies, critical geopolitics and cultural-historical geographies of the tropical region. Indeed, while equatorial sites have their own unique advantages for the space industry, postcolonial scholars have demonstrated how tropical spaces have been assigned particular characteristics, drawing on a wider body of work that has addressed the complicity of western culture in discourses of empire (Pratt 1992, Said 1993). Such characteristics relate to opportunities for adventure, the presence of bountiful natural resources, and the danger and excitement of exotic allure. For Richard Phillips, ‘European empires and European masculinities were imagined in geographies of adventure’ in children’s novels such as Daniel Defoe’s *Robinson Crusoe* (1719), famously set on a fictitious tropical island (Phillips 1997). Twentieth century imaginative spaces of adventure have also been interpreted in relation to geographies of empire, whether in relation to historical figures like T E Lawrence, or fictional archetypes such as James Bond or Tintin (Dawson 1994, Dodds 2003, Dunnett 2009). 6 According to Graham Dawson, ‘the modern adventure tale is imbued with the imaginative resonance of colonial power relations underpinned by science and technology’, while at the same time, adventure becomes ‘balanced with anxiety and desire’ in the colonial context (Dawson 1994, 59, 53). The adventure genre and its associated tropes remain closely connected to narratives of space exploration, as seen in examples such as the 1964 feature film *Robinson Crusoe on Mars*, or Andy Weir’s 2014 novel *The Martian* and subsequent film release, whose extra-terrestrial spaces are represented through a combination of masculine endeavour and exotic encounter (Crossley 2010). Beyond generic conceptions of adventure, research in cultural and historical geography has drawn on the concept of ‘tropicality’ as a way of understanding certain representations and experiences of tropical spaces, that also relate to wider cosmographic frameworks (Arnold 2000). As Denis Cosgrove reminds us, ‘the originating tropics [of Cancer and Capricorn] are celestial rather than terrestrial markers within a geocentric cosmos’ (Cosgrove 2005, 199). They comprise two great circles that delineate the equatorial band of the earth where the sun passes through the zenith directly above at least once a year, as defined by the earth’s axial tilt. It is the interplay between this cosmographic definition of the tropics, and ethnographic and biological understandings of the tropics, which has defined notions of tropicality in the western world. Such framings can be traced to medieval notions of an equatorial ‘torrid zone’ as part of a Ptolemaic theory of world climatic regions (Cormack 1994). While being considered a barrier to human (European) civilization, the equatorial zone has also been seen as a realm where ‘the superabundance of nature was believed to overwhelm human endeavour’ (Leys Stepan 2001, 18). Yet as voyages of discovery opened up previously unencountered spaces to European experience and representation, imaginative geographies of the tropics persisted. Some, for example, have associated ‘paradisal geographies’ with 7 ‘New World islands ... as the location of peoples as yet unfallen and as sites of natural richness’ (Withers 1999, 84). Others have recognised the ways in which ‘tropicality has frequently served as a foil to temperate nature’, or as a ‘site for European fantasies of self-realisation’ (Driver and Martins 2005, 3, 4). Tropical spaces have also been associated with forms of modernity, whether in relation to early modern voyages of discovery, or in ‘modernist abstraction[s] of nature’ in twentieth century landscape designs (Leys Stepan 2001, 210). This paper adapts cultural and cosmographical readings of tropicality in the context of late- imperial techno-science to consider a concept of ‘cosmological tropicality’, a sense in which tropical spaces are more intimately aligned with the heavenly movements of the cosmos, and therefore could hold the key to the future of space exploration. Geographers Felix Driver and Luciana Martins have argued that understandings of tropicality have been largely framed through ‘projections’ of imagined geographies, and that researchers should attempt to understand such representations as they have been produced, negotiated or contested (Driver and Martins 2005, 5). Touching on similar themes, Gerry Kearns’ research on the late-nineteenth-century travels of Mary Kingsley and Halford Mackinder in colonial Africa has investigated the ways in which personal encounters and travel experiences helped shape the identities of British imperial subjects, informing their broader geopolitical outlooks (Kearns 1997). As such, while Clarke’s projections of [the tropics] Ceylon / Sri Lanka are inherently representational, they also relate closely to the tangible, experienced geographies of his life in Ceylon / Sri Lanka, and present the unusual perspective of a western individual who lived on this island for most of his adult life. In approaching Clarke by thinking through his experiences as well as the representational texts he produced, it becomes possible to engage ‘socio-technical’ understandings of the nuanced relationships between technology, society, representation, discourse and experience. Here, drawing from Bruno Latour’s conception of 8 technology as a social and material construction, Nick Bingham has called for a renewed understanding of socio-technical assemblages ‘between diverse people, non-humans and places’ (Bingham 2005, 201). As such, this paper attempts to understand the extent to which Clarke’s projections of outer space technology were shaped by negotiation with, and experience of, the specific geographies of twentieth century Ceylon / Sri Lanka. In his aforementioned essay on tropicality, Cosgrove warns that, ‘in rehearsing – even with critical intent – the ways in which Europeans so closely and outrageously have bound tropical ethnography into a mutually deterministic embrace with the physical environments of the tropics, we risk perpetuating the silencing of voices speaking from within tropical space’ (Cosgrove 2005, 198). The same could be said of any account that purports to interpret the visions of one Englishman’s fantasy of space exploration in a tropical ‘paradise’. Yet there remains value in ascertaining the ways in which outer space has been connected to earthly imaginative geographies, and how experiences of particular places have informed geopolitical cultures of outer space. While acknowledging the limitations of such an approach, this paper seeks to investigate the extent to which Clarke’s socio-technical constructions of Ceylon / Sri Lanka were formulated with respect to local culture and politics. Tariq Jazeel has, for example, contested the notion of ‘Sri Lankan island-ness’, explaining how the perceived unity of the Sri Lankan state today can be traced to British imperial rule from 1815 to 1948, before which the island had been made up of a number of separate kingdoms since the fifteenth century (Jazeel 2009, Duncan 1990). The replacement of this multi-cultural space with a unitary British imperial island colony was, according to one researcher, reflected in a sense of modernity in the everyday material cultures of local people, while the damaging legacy of the unification can be clearly seen in the destructive civil war that plagued the country from 1983 to 2009 (Wickramasinghe 2009). Such issues are pertinent to understanding the complex interactions 9 that Clarke had with the places and landscapes of Ceylon / Sri Lanka, particularly the understandings of modernity and progress that were central to Clarke’s world-view. Discourses of space exploration have, in the ways outlined here, been connected to a variety of familiar geographical imaginations concerning empire, adventure and the anticipation of a technologically-driven future. Yet studying Arthur C. Clarke adds the further perspective of experiencing and representing tropical spaces as part of a critical geopolitics of outer space, an exercise that has only received partial critical attention through Redfield’s work on French Guiana. By turning to three phases in Clarke’s life and works we can see how cultures of empire, technological determinism and ‘cosmological tropicality’ are played out in the immediate context of late-twentieth-century Ceylon / Sri Lanka.

#### In French Guiana, the space center fails to transcend its colonial history. The landscape is bulldozed for roads that are built for rockets, not people. The tropical locality is necessary for rockets to be launched, but the space industry leaves behind the colonized on geographic lines with fewer resources and no political agency. The ESA builds roads in French Guiana without consulting its people, without employing them, and without undoing economies of colonialism. Discourses of space exploration attempt to transcend the earth while forgetting the colonial relations they leave behind, reifying planetary structures of violence.

Redfield 02

Redfield, Peter. “The Half-Life of Empire in Outer Space.” *Social Studies of Science,* Vol. 32, No. 5/6, Oct-Dec 2002. Pages 807-811. <https://redfield.web.unc.edu/wp-content/uploads/sites/9305/2015/08/half-life-empire-SSS.pdf>

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In this small struggle over a road, we glimpse a larger array of elements in play. Traffic flow involves humans, machines and contours of space, threading in and out of categories of nature and culture. Planetary geometry affecting satellites, a topography shaped by settlement patterns past and present, patterns of circulation combining gasoline and air-conditioning, different claims and understandings of sovereignty, all find their way into this particular, minor stretch of asphalt. For a brief moment, it becomes the political focus of French Guiana, a matter of some concern in a few offices in Paris, and a question mark on the production schedule of a few client satellites. A symmetrical analysis of the sort championed by Bruno Latour could insightfully dance between elements, following the attempts of different parties, human and nonhuman, individuals and non-individuals, to translate the alignment to their advantage. Outer space, or at least a segment of the far-flung, shifting networks that compose it, grows momentarily local. This locality is differently understood from different directions, to be sure. For space officials it is an obstacle, for elected officials an article of negotiation, and for the constituents of MDES a focus for political mobilization. For all, however, it remains a passage point, a problem in which they are all invested, along with the rocket and its satellite load. Whatever the space centre might do, however, it could not hide the length of its network. Length and alignment of connections are precisely what are called into question by the use of a term like 'colonialism' by an organization like MDES. Beyond disagreeing over whether the road was a technical or political object, best understood in terms of the potential hazards of combustion or in terms of continued domination of French and other European interests, CSG and MDES disagreed on what 'distance' and 'movement' themselves signified. Categories of'nature' and 'society' are not the only significant divide here; rather, we have divisions between human groups based on their prior position and relationships. The space centre and its opponents stood on different sides of the history of exploration, deploying different spatial-temporal frames. To illustrate this difference, let us look more closely at the efforts of the space centre and of elected officials to resolve the situation. A poster (Figure 1) used by the space centre in its public relations campaign later that year displays the heads of three French astronauts (including the first woman) next to the phrase 'I'espace - les enjeux du futur! (space - the stakes of the future!)'. On the left side of the image, a number of small figures in spacesuits build a gigantic golden head against the stars. In the lower right, breaking the curve of the planet, a small rocket base juts out from a welter of green jungle. Tellingly, there are no human figures amid the forest, though one of the spacesuits finds reflection in the gleaming cheek of the emerging giant. **This new being [of a rocket] transcends** both **blood and territory, [not] requiring** neither a mother nor **an attachment to the ground. The local** world **of the space centre assumes translocal dreams, a desire for mobility with long colonial heritage**. The poster is a call to wonder, to an adventure not that removed from that of Verne's fantasy, though devoid of the latter's irony and humour. The future is at stake, to be sure, but terms of the wager are already known. This poster is remarkable in a number of ways, perhaps most of all in how little it relates to the current operations of CSG. No astronaut has been launched from Kourou, nor is one about to be, despite the longstanding dreams of both the French and European Space Agencies. Human routes into space still pass through Florida and Kazakhstan. The everyday, practical business of the Guiana Space Centre is the launch of commercial and research satellites, not the construction of new beings beyond the atmosphere. And yet, precisely at a moment of tension, the centre officially resorts to this fantasy of exploration, one that recasts its rather earthly business as a noble adventure. Rather than playing the r6le of the nefarious financiers in Lang's old film, the CSG poster identifies with his hero Helius, reaching for the stars. The image is a very general one, potentially connected in a vague way to all moments of prior earthly exploration and adventure. These representatives of France act in the name of anyone who might look up from earth. At the same time, both French Guiana, and its particular history are clearly incidental within the poster's vision. **The focus rests on outer space and the future, not the launchpad and the past**. Unsurprisingly, neither this particular poster nor the event it advertised appears to have made much impact beyond the space centre's immediate circles.45 The image of smiling Europeans dedicated to joining the human conquest of outer space offered little to assuage the sensitivities of those Guyanais who signed MDES's road petition, or involve them in the imagined community of would-be astronauts, awaiting the day when European rockets might lift unprofitable humans rather than profitable machines. As witnessed in the road dispute itself, the Ariane programme is the focus of suspicion far more than wonder in Guyanais politics. The language of 'development', on the other hand, resonates continually throughout French Guiana, in large and small ways between the rocket and its surrounding sea of trees. The compromise accepted by the politicians who first objected to the road closure revolved around this term, and CSG's financial participation in another new initiative for the region. At the centre of such development discourse lies an insistence on recognition and redistribution of growth, within the framework of asymmetrical world and regional economies. The future here is one of intensification more than expansion, an accretion in place rather than a departure from it. Elements of this vision of development are particular to this peculiar political context: French Guiana remains attached to France as an assimilated former colony, one that combines a relatively plural, low-density population with a relatively high standard of living, and features far more in the way of forest than farms. But the overall frame translates widely, amid an assemblage of interrelated programmes, measurements, dreams and material transfers circulating on an explicitly international scale. Emerging from colonial roots, this assemblage coalesced following World War II around the 'making and unmaking of the Third World' [Escobar (1995)].46 MDES partly framed its dismissal of the elected officials' compromise plan in terms of the anticipated shortcomings of its development effects, suggesting that in the end the results would serve the interests of France more than those of French Guiana. The open letter also decries the closure of the road in terms of eliminating the potential for farming and building on the land around it, recalling the earlier expropriation of small plots in the establishment of the space centre.47 But even this clever rhetorical link between past and present does not dislodge the possibility of development, or the changing nature of the road itself amid an expanding population of people, cars and commodities. Rather, it reinforces a local claim through an allusion to longer networks of history, using them to define the current sense of injustice. Any longer networks of the present must acknowledge these prior alignments, for here the definition of the local includes them. In an ethnographic examination of agricultural practices in a village in India, Akhil Gupta [(1998): 232] suggests a key aspect of understanding the political condition of the population in question is their status as 'failed subjects of modernity, a position whose burden they feel acutely'. The very framing of development projects contains a modernist sensibility, one in which certain people are moving ahead and others left behind. From a postcolonial perspective, such an experience of time is geographically inflected, such that the status of being 'left behind' is quite explicitly and continually mapped. In such a mapping, small things like roads can loom large, simultaneously signifying fulfilment and lack, the anger of having never quite as much. From this perspective, localization is a political project, a demand for spatial accountability on the part of external forces. 'What use is the space centre to us?' But it is a demand that can never quite be satisfied, as long as the future lies elsewhere. 'What do we get? Colour TV, but they still think we're savages.' A few years after this struggle over the space road, another round of disturbances erupted that I followed, this time at a distance.48 The issues appeared different in detail, but not in form: a crisis in education involving the stakes of the future, the failures of history, and local place in time.

#### In trying to reach beyond the earth, space exploration recreates historical geographies of colonialism. By creating a transcendent definition of the human, space exploration enables colonized others to be marked for violence. Colonial roads and launch sites haunt outward progress, resulting in more socio-economic injustice. Space is not a delineated location, but a time-knot of earthbound colonial legacies and futurist discourses. Any attempt to extend into space without considering colonial histories inevitably reproduces them. The 1AC specifically links because it claims that only transcending beyond the earth can solve earthbound crises of violence.

Redfield 02

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What then to say about those space enthusiasts, dreaming of their extraterrestrial networks? By surpassing the globe would they really leave it behind? In an essay first written in the midst of Space Race fervour, Hannah Arendt (1978 [1968]) wonders what the 'conquest of space' might do to the 'stature of man'. Her hope is for a renewed appreciation of the earth as 'the centre and home of mortal men', and a recognition of 'factual mortality' among the conditional limits framing science. Her fear is of a reduction of technology to a biological process, and language to the 'extreme and in itself meaningless formalism of mathematical signs' which would not merely lower the 'stature of man' but actively destroy it [Arendt (1978 [1968]): 279-80]. Amid its anachronistic language and European humanist frame, the essay identifies a crucial aspect of space exploration: the promise of achieving an Archimedean point of sorts, a position beyond the earth from which to survey the planet itself, a location with clear relational implications. The prospect worries Arendt, for she sees the promise as an incomplete one that will be falsely read as an affirmation of power and a transcendence of limits. Once beyond the atmosphere, humans would imagine themselves to be beyond themselves, and thus lose sight of where they are.49 Quoting Franz Kafka, Arendt writes that man 'found the Archimedean point, but he used it against himself; it seems he was permitted to find it only under this condition' [Arendt (1978 [1968]): 278] .50 Four decades later, thinking about a small road in the tropics, Arendt's fears read somewhat differently. For all of the dreams of the world's space agencies, the mythic allusions in rocket and programme names, the indomitable enthusiasm of space aficionados, the multiple imagination of science fiction, and even the farce of the world's first space tourist, human spaceflight has yet really to move beyond the earth. In the absence of the sure reflection of either a god or an alien above, meaning is still measured from below.51 The point is not simply abstract. As the sky fills with satellites, the prospect of extraterrestrial perspective actively materializes, allowing the production and consumption of distinctly global images in support of such diverse causes as corporate profits, environmental awareness and sustainable development. At the same time, however, the import of Kafka's phrase shifts along with the expanding field of vision. For whom and against whom has this partial transcendence been used - which humans and nonhumans, when and where? Surely **the legacy of imperial** vision **must be incorporated in the act of looking down**. Surely past perspectives of differing elevations, past patterns of contest and association are not simply translated or combined. Under the bright light of a higher lens, the 'man' of Arendt's essay splits asunder, not only through the acceleration of instrumental reason and its lurch beyond the atmosphere, but also through the widening and lowering of a frame of historical reference to include human difference. However much astronauts may still try to birth a singular human in the sky, that new being faces multiple demands of ancestry. Here I return again to this paper's theoretical guides, Latour and Chakrabarty, and to the fields of knowledge I have cast them to represent. Latour's principle of symmetry undoes boundaries and oppositions. Rather than worrying about the 'legitimacy' of the modern age in terms of the emergence of modern reason from European religious heritage, in the lineage of Blumenberg (1983 [1976]), he short-circuits modernity altogether, suggesting that its very self-conception represents an illusion. As it turns out, we have never abandoned transcendence at all, only misrecognized it, and immanence as well. In a world of moving networks we are always somewhere and never quite anywhere at all. From this perspective, a rocket launch could be the perfect conjoining of formerly opposed categories, a moment where the thing becomes present in rising above. It would not come as a particular surprise to most practitioners of science studies to connect satellites and launchpads, however much distance separates them, or to classify them alongside a road as under a heading of transportation and communication. And it would be in keeping with the contemporary concentration on practice to complicate and deflate the progressive vision of a space agency by focusing on unintended side effects and tensions of possible failure to which it must continually respond. Appeals to a broader swath of cultural production around science and technology, including public and popular forms of representation, likewise have grown familiar; indeed, who now can imagine outer space without some reference to science fiction? But one key aspect of the story I am telling deviates from much writing in science studies, even in many of its critical and insightful renditions. In French Guiana, 'society' is not a singular form, commonly opposed to nature, but rather an unevenly multiple field of tension. There the historical drama extends ever offstage, fractured not only by internal distinctions but also by a continuing and overriding sense of geographic displacement and difference. Here Chakrabarty's postcolonial sense of chronology can be illuminating. In discussing the translation of life-worlds and the dilemmas of minority histories, Chakrabarty [(2000: 111-13] recognizes what he calls 'time-knots', the possibility of multiple temporalities within a single moment. Like Latour's nonmodern anthropology, the time-knot counters the binary categories of a modernist narrative, unveiling the sacred within the secular in the space between belief and practice, and revealing objects as complexly embedded in time. But Chakrabarty's vision is never singular; he is not only opposing modern Europe to its medieval past, but also to Bengal. The concept of the time-knot allows him coherently to represent the conflicting elements of the life-world of modernizing Bengalis, people who fuse continuity and rupture to inhabit more than one universe simultaneously, and do so across geo-historical divides. Thus a stone spice grinder and an electric stove can inhabit the same present; they are both 'now', even though they signify in different temporal directions, standing in for different ages while mediating caste (as well as international) relations. Thus an Indian physicist can both win the Nobel Prize and take a ritual bath, simultaneously maintaining global scientific and local personal spheres [Chakrabarty (2000): 243, 254].52 Rather than resolving the tension between contradictory historical frames of abstraction and dwelling, Chakrabarty seeks to maintain it, acknowledging both connection and difference within the 'now'. In our story, we can extend the principle of the time-knot to space, and consider 'outer space' as a dense tangle of space and time. Such an outer space contains both astronauts and aliens, and flows around both rockets and roads. It is full of the future, but also infused with the past; it is as vast and infinite as we can imagine, but also replete with small and specific struggles. Most crucially, it frames the globe, simultaneously marking the extent of human difference and the limit possibility of its geometric transcendence. Like history, it is inherently contested, but unequally so. To provincialize outer space, then - to the extent that such an endeavour is possible - would not be simply to reduce it in scale, or suggest that it represents but one of many possible framings of the earth. Rather, it would entail recognizing the tensions of human difference running through differences of scale, and even through a limiting frame. So at last we come to a moral. Every place is local, but not equally so; in considering points of context we must also factor in their historical mass and inertia, as well as potential isotopes of colonial rule**. French Guiana is a setting where** a routine form of **rocketry directly crosses the remains of less final frontiers.** There the very length and direction of networks affect the significance of their presence, the extent to which they can 'be' local. Dreams of spaceflight and more earthly independence both linger along a singularly modest stretch of road. But where one embraces outward motion, the other struggles against the inertia of earlier expansions. In such a setting, stabilization can never quite appear complete, since difference extends into the very combination of time and space framing each narrative position. At a number of points in this paper I have suggested partial presences and after-effects through time: dreams of space flight within the Ariane project; perceptions of colonialism in French Guiana; the persistence of past representations amid the making of present practice. Thus, in mediating Chakrabarty's provincializing urge and Latour's call for symmetry, I imagine **colonial history extending into an uneven decay curve against the sky. Receding from the ground, it still emits radiation, and oversees the boundaries of provinces below**. Following this metaphor one would work to plot such a curve, now testing its limits, now recognizing them. Symmetry can be an excellent methodological principle, but the stakes of dissolving things equally vary in an unequal world. Even if globalization also produces localization, both processes are uneven, and hence unbalanced in their very symmetry of opposition [Appadurai (1996): 178-99; Gupta & Ferguson (1997)]. Whatever happened to empire in the second half of the 20th century, it did not simply vanish. Rather, it lingers on, even beyond the planet, amid the faint beckoning glow of the stars. **To move out invites another form of return**, a passage forward **through the** very **pasts we might think we are leaving behind.**

#### The alternative is a hauntological decolonizing intervention that refuses to debate on a colonized blank slate. We tell the stories of the dispossessed, the colonized, the materialized ghosts, and the haunted living. Blood seeps from colonial geographies through the stratosphere and into the space topic – neutral representations of the cosmos are built on the back of racial violence. The alternative’s pedagogy addresses the materiality of colonial ghosts, insisting on decolonization not recolonization.

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Michalinos Zembylas, Vivienne Bozalek, and Siddique Motala. “A Pedagogy of Hauntology: Decolonizing the Curriculum With GIS.” January 4, 2020. <http://capaciousjournal.com/article/a-pedagogy-of-hauntology/>

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In their influential essay “Decolonization is Not a Metaphor,” Tuck and Yang (2012) argue that decolonization brings about real questions of land, settlement, and occupation. Land, according to Barad, “is not a property or territory; it is a time-being marked by its own wounds and vitality, a layered material geo-neuro-bio-graphy of bones and bodies, ashes and earth, where death and life meet” (2018, 238).“To understand the possibilities for a decolonizing university,” then, adds la paperson, “we must begin with a discussion of colonialism and its technologies at the material and affective level,“to settle, to self-sustain, to seduce, and to school” (2017, xxii). Settler colonialism is a set of technologies, says la paperson (2017), that reappropriate land and remake bodies and affects. If land is the prime concern of settler colonialism, then land as a biopolitical target is also the prime concern of decolonization. A decolonizing university, therefore:is not just about decolonizing the “representational” work of knowledge production that we associate with universities […] It is about the steam and pistons, the waterworks, the groundworks, the investments, the emplacements, the institutional-governmental-capitalist rhizomatics of the university (la paperson 2017, 32). The question, then, is, what can we do, as higher education instructors, to expose the materiality and affectivity of a colonial university–the ruins, traces, fragments, gaps, absences and displaced actors and agencies that register affectively? Siddique’s storytelling intervention in the GIS class aims to make visible the coloniality of apartheid through a hauntological approach, using the tools of his profession that bring to the surface the affectivity and materiality of the forced relocations in District Six which has been rendered invisible through dis/continuous chronological periods. The **geomatics** tools **show how** these **dis/continuous periods** (then and now) can be seen to **bleed through each other by tracing** and re/turning the **ghosts of the apartheid machinery** which **used** abusive systems of power and organized forces **to destroy property, land, and people’s lives**. The marks on the land which are revealed through the techniques are situated on the very location that students were studying engineering – they are “ghostly non/existence” in multiple places at the same time (there/here, then/now) (Barad 2018, 231). **This alerts students to the ghostly matters of apartheid**, **and** to **the effects of the colonial past** on the people and the land of District Six. As Barad says, “The past is not closed . . . ‘past’ and ‘future’ are iteratively reconfigured and enfolded through the world’s intra-activity” (2010, 261). In this sense, Siddique’s **storytelling intervention performs** a sort of **an epistemic disobedience** to normative expectations in higher education institutions, particularly in such fields as engineering. **GIS within the frame of a pedagogy of hauntology** **troubles** and queers **the colonial approach which renders Whites as the normative** ontological, epistemological, and ethical category **and directs our attention toward ‘that’ which has been muted** or rendered passive **by coloniality**. Hauntology can inspire and support decolonization processes at the university level by showing how temporalities and spaces are entangled and threaded through one another and how these matter. We would, therefore, argue that interventions which are grounded in a hauntological decolonizing pedagogy within the colonizing university entail two important principles: 1) An emphasis on revealing the absent/presences of the there/then, here/now and the effects of the past/present/future on people’s lives and the environment; 2) A curricular emphasis on identifying and challenging the affective investments that underlie varied responses toward coloniality—by students and instructors alike. A hauntological decolonizing pedagogy does not only make subjugated knowledges key points of reference in the curriculum, while troubling how Eurocentric supremacy continues to inform what legitimate knowledge is. It is also attentive to questions of how presences/absences have materialized. It emphasizes the need to mobilize new tools that expose the ongoing sufferings as a result of coloniality. More importantly, **a hauntological decolonizing pedagogy is attentive to how** questions of **presences/absences have materialized, and** it emphasizes the need to mobilize new tools that expose **the ongoing sufferings** as a result of **coloniality**. Time, space, and pedagogy are troubled and queered by the re/turning of matter, place, people and events, rather than simply being revisited. From this perspective, the relationship between affect and social justice in the context of hauntological decolonizing pedagogy is not simply about the creation of affective connections and openings that acknowledge suffering. Complicity to coloniality has to be recognized and become part of a pedagogy that exposes the absent/presences of the there/then here/now and the effects of the past/present on people’s lives and the environment (Zembylas 2019). Furthermore, the contribution of a hauntological decolonizing pedagogy is that it recognizes the affective complexities of engaging with the ghosts of the past/present. Consequently, it is not driven by a naïve perception that sentimentalizes this engagement or idealizes resistance (Zembylas 2016). On the contrary, a hauntological decolonizing pedagogy acknowledges that there are no uncontaminated spaces of resistance and that any resistance has to take place within the available structures of power. This implies that a hauntological decolonizing pedagogy exceeds humanistic frameworks, discourses, and practices by bringing into the pedagogical, ethical, and political spaces of learning the entanglement of human and more-than-human (Zembylas 2018**). This pedagogical approach can** alter the possibilities of **promot**ing **social justice agendas**, precisely because it generates spaces for contesting social inequalities **and provide openings for new political claims that do not naturalize the past or** the **present**, but see it as “getting ready to speak at length about ghosts, inheritance, and generations, generations of ghosts” (Derrida 1994, xix).

## Case

### Framing

#### Extinction doesn’t come 1st:

#### 1. Reject worst case thinking – cognitive science disproves that framework.

Sunstein 2**[Cass, Karl N. Llewellyn Distinguished Service Professor, University of Chicago, Law School and Department of Political Science, Probability Neglect: Emotions, Worst Cases, and Law, [http://www.yalelawjournal.org/pdf/112-1/SunsteinFINAL.pdf](http://www.yalelawjournal.org/pdf/112-1/SunsteinFINAL.pdf" \t "_blank))**

If someone is predisposed to be worried,**degrees of unlikeliness**seem to**provide no comfort, unless one can prove that harm is**absolutely **impossible, which**itself**is not possible.1**[A]ffect-rich outcomes yield pronounced overweighting of small probabilities . . . .2 On Sept. 11, Americans entered a new and frightening geography, where the continents of safety and danger seemed forever shifted. Is it safe to fly? Will terrorists wage germ warfare?**Where is the line between reasonable precaution and panic**? Jittery, uncertain and assuming the worst, many people have answered these questions by forswearing air travel, purchasing gas masks and radiation detectors, placing frantic calls to pediatricians demanding vaccinations against exotic diseases or rushing out to fill prescriptions for Cipro, an antibiotic most experts consider an unnecessary defense against anthrax.3 I. RISKS, NUMBERS, AND REGULATION Consider the following problems: • People live in a community near an abandoned hazardous waste site. The community appears to suffer from an unusually high number of deaths and illnesses. Many members of the community fear that the hazardous waste site is responsible for the problem. Administrative officials attempt to offer reassurance that the likelihood of adverse health effects, as a result of the site, is extremely low.4 The reassurance is met with skepticism and distrust. • An airplane, carrying people from New York to California, has recently crashed. Although the source of the problem is unknown, many people suspect terrorism. In the following weeks, many people who would otherwise fly are taking trains or staying home. Some of those same people acknowledge that the statistical risk is exceedingly small. Nonetheless, they refuse to fly, in part because they do not want to experience the anxiety that would come from flying. • An administrative agency is deciding whether to require labels on genetically modified food. According to experts within the agency, genetically modified food, as such, poses insignificant risks to the environment and to human health. But many consumers disagree. Knowledge of genetic modification triggers strong emotions, and the labeling requirement is thought likely to have large effects on consumer choice, notwithstanding expert claims that the danger is trivial. How should we understand human behavior in cases of this sort? My principal answer, the thesis of this Essay, is that **when intense emotions are engaged, people**tend to**focus on the adverse outcome, not**on**its likelihood.** That is, they are not closely attuned to the probability that harm will occur.**At the individual level**, this phenomenon, which I shall call**“probability neglect,” produces**serious difficulties of various sorts, including excessive worry and**unjustified behavioral changes. When people neglect probability, they**may also**treat some risks as**if theywere**nonexistent, even though**the**likelihood of harm**, over a lifetime**, is far from trivial.**Probability neglect can produce significant problems for law and regulation. As we shall see, regulatory agencies, no less than individuals, may neglect the issue of probability, in a way that can lead to either indifference to real risks or costly expenditures for little or no gain. If agencies are falling victim to probability neglect, they might well be violating relevant law.5 Indeed, we shall see that the idea of probability neglect helps illuminate a number of judicial decisions, which seem implicitly attuned to that idea, and which reveal an implicit behavioral rationality in important pockets of federal administrative law. As we shall also see, an understanding of probability neglect helps show how government can heighten, or dampen, public concern about hazards. Public-spirited**political actors**, no less than self-interested ones, can**exploit probability** neglect so as to promote attention to problems that may or may not deserve public concern. It will be helpful to begin, however, with some general background on individual and social judgments about risks. A. Cognition On the conventional view of rationality, probabilities matter a great deal to reactions to risks. But emotions, as such, are not assessed independently; they are not taken to play a distinctive role.6 Of course, people might be risk-averse or risk-inclined. For example, it is possible that people will be willing to pay $100 to eliminate a 1/1000 risk of losing $900. But analysts usually believe that variations in probability should matter, so that there would be a serious problem if people were willing to pay both $100 to eliminate a 1/1000 risk of losing $900 and $100 to eliminate a 1/100,000 risk of losing $900. Analysts do not generally ask, or care, whether risk-related dispositions are a product of emotions or something else. Of course, it is now generally agreed that**in thinking about risks, people**rely on certain heuristics and**show identifiable biases.**7 Those who emphasize heuristics and biases are often seen as attacking the conventional view of rationality.8 In a way they are doing just that, but the heuristicsand- biases literature has a highly cognitive focus, designed to establish how people proceed under conditions of uncertainty. The central question is this: When people do not know about the probability associated with some risk, how do they think? It is clear that when people lack statistical information, they rely on certain heuristics, or rules of thumb, which serve to simplify their inquiry.9 Of these rules of thumb, the “availability heuristic” is probably the most important for purposes of understanding risk-related law.10 Thus, for example, “a class whose instances are easily retrieved will appear more numerous than a class of equal frequency whose instances are less retrievable.”11 The point very much bears on private and public responses to risks, suggesting, for example, that people will be especially responsive to the dangers of AIDS, crime, earthquakes, and nuclear power plant accidents if examples of these risks are easy to recall.12 This is a point about how familiarity can affect the availability of instances. But salience is important as well. “The impact of seeing a house burning on the subjective probability of such accidents is probably greater than the impact of reading about a fire in the local paper.”13 So, too, recent events will have a greater impact than earlier ones. The point helps explain much risk-related behavior. For example, whether people will buy insurance for natural disasters is greatly affected by recent experiences.14 If floods have not occurred in the immediate past, people who live on flood plains are far less likely to purchase insurance.15 In the aftermath of an earthquake, the proportion of people carrying earthquake insurance rises sharply—but it declines steadily from that point, as vivid memories recede.16 For purposes of law and regulation, the problem is that the availability heuristic can lead to serious errors of fact, in terms of both excessive controls on small risks that are cognitively available and insufficient controls on large risks that are not.17 The cognitive emphasis of the heuristics-and-biases literature can be found as well in prospect theory, a departure from expected utility theory that explains decision under risk.18 For present purposes, what is most important is that prospect theory offers an explanation for simultaneous gambling and insurance.19 When given the choice, most people will reject a certain gain of X in favor of a gamble with an expected value below X, if the gamble involves a small probability of riches. At the same time, most people prefer a certain loss of X to a gamble with an expected value less than X, if the gamble involves a small probability of catastrophe.20 If expected utility theory is taken as normative, then people depart from the normative theory of rationality in giving excessive weight to lowprobability outcomes when the stakes are high. Indeed, we might easily see prospect theory as emphasizing a form of probability neglect. But in making these descriptive claims, prospect theory does not specify a special role for emotions. This is not a puzzling oversight, if it counts as an oversight at all. For many purposes, what matters is what people choose, and it is unimportant to know whether their choices depend on cognition or emotion, whatever may be the difference between these two terms. B. Emotion No one doubts, however, that in many domains, people do not think much about variations in probability and that emotions have a large effect on judgment and decisionmaking.21 Would a group of randomly selected people pay more to reduce a 1/100,000 risk of getting a gruesome form of cancer than a similar group would pay to reduce a 1/200,000 risk of getting that form of cancer? Would the former group pay twice as much? With some low-probability events, anticipated and actual emotions, triggered by the best-case or worst-case outcome, help to determine choice. Those who buy lottery tickets, for example, often fantasize about the goods associated with a lucky outcome.22 With respect to**risks of harm,**many of our ordinary ways of speaking**suggest**strong emotions: panic,**hysteria,** terror. People might refuse to fly, for example, not because they are currently frightened, but because they anticipate their own anxiety, and they want to avoid it. It has been suggested that people often decide as they do because they anticipate their own regret.23 The same is true for fear. Knowing that they will be afraid, people may refuse to travel to Israel or South Africa, even if they would much enjoy seeing those nations and even if they believe, on reflection, that their fear is not entirely rational. Recent evidence is quite specific.24 It suggests that people greatly neglect significant differences in probability when the outcome is “affect rich”—when it involves not simply a serious loss, but one that produces strong emotions, including fear.25 To be sure, the distinction between cognition and emotion is complex and contested.26 In the domain of risks, and most other places, emotional reactions are usually based on thinking; they are hardly cognition-free. When a negative emotion is associated with a certain risk—pesticides or nuclear power, for example—cognition plays a central role.27 For purposes of the analysis here, it is not necessary to say anything especially controversial about the nature of the emotion of fear. The only suggestion is that **when emotions are intense, calculation is less likely to occur,**or at least that form of calculation that involves assessment of risks**in terms of not only**the**magnitude but also**the**probability**of the outcome. Drawing on and expanding the relevant evidence, I will emphasize a general phenomenon here: In political and market domains, people often focus on the desirability of the outcome in question and pay (too) little attention to the probability that a good or bad outcome will, in fact, occur. It is in such cases that people fall prey to

**probability neglect,** which**is**properly treated as**a**form of**quasi-rationality.**28 Probability neglect is especially large when people focus on the worst possible case or otherwise are subject to strong emotions. When such emotions are at work, people do not give sufficient consideration to the likelihood that the worst case will actually occur. This is quasi-rational because, from the normative point of view,**it is not**fully**rational to treat a 1% chance of X as equivalent,** or nearly equivalent**, to a 99% chance of X,**or even a 10% chance of X. Because people suffer from probability neglect, and because neglecting probability is not fully rational, the phenomenon I identify raises new questions about the widespread idea that ordinary people have a kind of rival rationality superior to that of experts.29 Most of the time, experts are concerned principally with the number of lives at stake,30 and for that reason they will be closely attuned, as ordinary people are not, to the issue of probability. By drawing attention to probability neglect, I do not mean to suggest that most people, most of the time, are indifferent to large variations in the probability that a risk will come to fruition. Large variations can, and often do, make a difference—but when emotions are engaged, the difference is far less than the standard theory predicts. Nor do I suggest that probability neglect is impervious to circumstances. If the costs of neglecting probability are placed “on screen,” then people will be more likely to attend to the question of probability.31 In this light it is both mildly counterintuitive and reasonable, for example, to predict that people would be willing to pay less, in terms of dollars and waiting time, to reduce lowprobability risks of an airplane disaster if they are frequent travelers. An intriguing study finds exactly that effect.32 For similar reasons, market pressures are likely to dampen the impact of probability neglect, ensuring that, say, risks of 1/10,000 are treated differently from risks of 1/1,000,000, even if individuals, in surveys, show relative insensitivity to such differences. Acknowledging all this, I emphasize three central points. First, differences in probability will often affect behavior far less than they should or than conventional theory would predict. Second, private behavior, even when real dollars are involved,33 can display insensitivity to the issue of probability, especially when emotions are intensely engaged. Third, and most important, the demand for legal intervention can be greatly affected by probability neglect, so that government may end up engaging in extensive regulation precisely because intense emotional reactions are making people relatively insensitive to the (low) probability that the relevant dangers will ever come to fruition. C. Law It is not at all clear how the law should respond to probability neglect. But at a minimum, the phenomenon raises serious legal issues in administrative law, at least under statutes banning agencies from acting unless they can show a “significant risk”34 or can establish that the benefits of regulation outweigh the costs.35 If agencies are neglecting the issue of probability (perhaps because the public is doing so as well), they may well be acting unlawfully. Indeed, the law of judicial review shows an inchoate understanding of probability neglect, treating it as a problem for which judicial invalidation is a solution.36 The only qualification is that the relevant law remains in an embryonic state. There is much to be done, especially at the agency level, to ensure that government is alert to the probability that harm will actually occur. Outside of the context of administrative law, an understanding of probability neglect will help us to make better predictions about the public “demand” for law. When a bad outcome is highly salient and triggers strong emotions, government will be asked to do something about it, even if the probability that the bad outcome will occur is low. Political participants of various stripes, focusing on the worst case, are entirely willing to exploit probability neglect. Those who encourage people to purchase lottery tickets, focusing on the best case, do the same. An understanding of probability neglect simultaneously helps show why jurors, and ordinary officials, are not likely to be moved much by a showing that before the fact, the harm was not likely to occur. For many people, what matters is that the harm did occur, not that it was unlikely to do so before the fact. For law, many of the most difficult questions are normative in character: Should government take account of variations in the probability that harms will occur? Should government respond to intense fears that involve statistically remote risks? When people suffer from probability neglect, should law and policy do the same thing? At first glance, we might think that even if people are neglecting probability, government and law at least should not—that the tort system and administrators should pay a great deal of attention to probability in designing institutions. If government wants to insulate itself from probability neglect, it will create institutions designed to ensure that genuine risks, rather than tiny ones, receive the most concern. Such institutions will not necessarily require agencies to discuss the worst-case scenario.37 And if government is attempting to increase public concern about a genuine danger, it should not emphasize statistics and probabilities, but should instead draw attention to the worst-case scenario. If government is attempting to decrease public concern with a risk that has a tiny probability of coming to fruition, it may be ineffective if it emphasizes the issue of probability; indeed, it may do better if it changes the subject or stresses instead the affirmative social values associated with running the risk.38 On the other hand, public fear, however unwarranted, may be intractable, in the sense that it may be impervious to efforts at reassurance. And if public fear is intractable, it will cause serious problems, partly because fear is itself extremely unpleasant and partly because fear is likely to influence conduct, possibly producing wasteful and excessive private precautions. If so, a governmental response, via regulatory safeguards, would appear to be justified if the benefits, in terms of fear reduction, justify the costs. II. PROBABILITY NEGLECT: THE BASIC PHENOMENON When it comesto risk,**a key question is whether people**can imagine or**visualize the worst-case outcome**.39 When the worst case produces intense fear, surprisingly little role is played by the stated probability that that outcome will occur.40 An important function of **strong emotions**is thus to**drive out quantitative judgments,** including judgments**about probability, by making** the best case or the**worst case seem highly salient.41 But it is important to note that probability neglect can occur even when emotions are not involved. A great deal of evidence** shows that whether or not emotions are involved, people are relatively insensitive to differences in probabilities, at least when the relevant probabilities are low. A. Insensitivity to Variations Among Low Probabilities Do people care about probability at all? Of course they do; a risk of 1/100,000 is significantly less troublesome than a risk of 1/1000. But many people, much of the time, show a remarkable unwillingness to attend to the question of probability. Several studies show that when people are seeking relevant information, they often do not try to learn about probability at all. One study, for example, finds that in deciding whether to purchase warranties for consumer products, people do not spontaneously point to the probability of needing repair as a reason for the purchase.42 Another study finds that those making hypothetical, risky managerial decisions rarely ask for data on probabilities.43 Or consider a study involving children and adolescents,44 in which the following question was asked: Susan and Jennifer are arguing about whether they should wear seat belts when they ride in a car. Susan says that you should. Jennifer says you shouldn’t . . . . Jennifer says that she heard of an accident where a car fell into a lake and a woman was kept from getting out in time because of wearing her seat belt . . . . What do you think about this?45 In answering that question, many subjects did not think about probability at all.46 One exchange took the following form: A: Well, in that case I don’t think you should wear a seat belt. Q (interviewer): How do you know when that’s gonna happen? A: Like, just hope it doesn’t! Q: So, should you or shouldn’t you wear seat belts? A: Well, tell-you-the-truth we should wear seat belts. Q: How come? A: Just in case of an accident. You won’t get hurt as much as you will if you didn’t wear a seat belt. Q: Ok, well what about these kinds of things, when people get trapped? A: I don’t think you should, in that case.47 These answers might seem odd and idiosyncratic, but we might reasonably suppose that some of the time, both children and adults focus primarily on bad scenarios, without thinking a great deal about the question of probability. Many studies find that significant differences in low probabilities have little impact on decisions. This finding is in sharp conflict with the standard view of rationality, which suggests that people’s willingness to pay for small risk reductions ought to be nearly proportional to the size of the reduction.48 Perhaps these findings reflect people’s implicit understanding that in these settings, the relevant probability is “low, but not zero,” and that finer distinctions are unhelpful. (What does a risk of 1/100,000 really mean? How different is it, for an individual, from a risk of 1/20,000 or 1/600,000?) In an especially striking study, Kunreuther and his coauthors found that mean willingness to pay insurance premiums did not vary among risks of 1/100,000, 1/1,000,000, and 1/10,000,000.49 They also found basically the same willingness to pay for insurance premiums for risks ranging from 1/650, to 1/6300, to 1/68,000.50 The study just described involved a “between subjects” design; subjects considered only one risk, and the same people were not asked to consider the various risks at the same time. Low probabilities are not likely to be terribly meaningful to most people, but most educated people would know that a 1/100,000 risk is worse than 1/1,000,000 risk. When low-probability risks are seen in isolation and are not assessed together, we have an example of the problem of “evaluability.”51 For most people, most of the time, it is very difficult to evaluate a low probability, and hence isolated decisions will pick up small or no variations between people’s assessments of very different risks. But several studies have a “within subjects” design, exposing people simultaneously to risks of different probabilities, and even here, the differences in probabilities have little effect on decisions. An early study examined people’s willingness to pay (WTP) to reduce various fatality risks. The central finding was that the mean WTP to reduce such risks was, for over 40% of the respondents, unaffected by a large variation in the probability of harm, even though expected utility theory would predict significant effects from such variations.52 A later study found that for serious injuries, WTP to reduce the risk by 12/100,000 was only 20% higher than WTP to reduce the same risk by 4/100,000, even though standard theory would predict a WTP three times as high.53 These results are not unusual. Lin and Milon attempted to elicit people’s willingness to pay to reduce the risk of illness from eating oysters.54 There was little sensitivity to variations in probability of illness.55 Another study found little change in WTP across probability variations involving exposure to pesticide residues on fresh produce.56 A similar anomaly was found in a study involving hazardous wastes, where WTP actually decreased as the stated fatality risk reduction increased.57 There is much to say about the general insensitivity to significant variations within the category of low-probability events. It would be difficult to produce a rational explanation for this insensitivity; recall the standard suggestion that WTP for small risk reductions should be roughly proportional to the size of the reduction.58 Why don’t people think in this way? An imaginable explanation is that in the abstract, most people simply do not know how to evaluate low probabilities. A risk of 7/100,000 seems “small”; a risk of 4/100,000 also seems “small.”59 Most people would prefer a risk of 4/100,000 to a risk of 7/100,000, and I have noted that joint evaluation improves evaluability, which would otherwise be extremely difficult.60 But even when the preference is clear, both risks seem “small,” and hence it is not at all clear that a proportional increase in WTP will follow. As suggested by the findings of Kunreuther and his coauthors, it is likely that in a between-subjects design, WTP to eliminate a risk of 4/100,000 would be about the same as WTP to eliminate a risk of 7/100,000, simply because the small difference would not matter when each risk is taken in isolation.

**2. Fantasies of extinction are a logic of self-preservation to infinitely defer meaningful engagement with settler colonialism**

Hamish **Dalley**, Assistant Professor of English at Daemen College, **2018**, “The deaths of settler colonialism: extinction as a metaphor of decolonization in contemporary settler literature,” Settler Colonial Studies, Vol 8, No 1 (Date Accessed: April 29, 2021)

In this way, these **settler-colonial narratives of extinction begin as a contemplation of endings and end as a way for settlers to persist**. As in the classical solution to the settler-colonial paradox of origins, the native must be **invoked** and **disavowed**, and **ultimately absorbed** into the settler-colonial body as a means of **accessing true belonging** and the **possibility of an authentic future** in place. Veracini’s description of the settler-colonial historical imagination thus applies, in modified but no less appropriate form, to visions of futurity haunted by the possibility of death: Settler colonial themes include the perception of an impending catastrophe that prompts permanent displacement, the tension between tradition and adaptation and between sedentarism and nomadism, the transformative permanent shift to a new locale, the prospect of a safe ‘new land’, and the familial reproductive unit that moves as one and finally settles an arcadia that is conveniently empty.67 And yet that parallel means that it is not entirely true to say that settlers cannot contemplate a future without themselves, or that they lack the metaphorical resources to imagine their own demise. **It is** in fact **characteristic of settler consciousness to continually imagine the end.** But it does so through a paradox that echoes the ambivalence of Freud’s death drive: **it is a fantasy of extinction** that tips over into its opposite **and becomes a method of symbolic preservation**, a technique for delaying the end, for living on in the contemplation of death.68 **The settler desire for death conceals** that wish – **the hope that**, between the thought of the end and the act, someone will intervene, something will happen to show that it is not really necessary, that **the settlers can stay, that they have value and can go on living**. **In this way**, **they** make their own redemption, an extinction that is an act of self-preservation, deferring the hard reckoning we know we lack the courage to face, and **avoid making the real changes – material, political, constitutional, practical** – that might alter our condition of being and set us on the path to a real home in the world. **We dream instead of ends, imagining worlds without us,** thinking of what it would be like not to be. But at every moment we know that that the dream is nothing but a dream; we know we will awake and still be here, unchanged, unchanging, living on, forever. Thus settlers persist even beyond the moment of extinction they thought they wanted to arrive.

**3. Compound Probability - Multiplied probabilities of long link chains have negligible net probabilities.**

**4. Decision Gridlock – Every course of action or inaction has a negligible possibility of causing extinction. This makes it impossible to prioritize averting existential risk because doing so would risk extinction.**

### Advantage

#### Alt cause – broad space privatization and existing debris.

Muelhapt et al 19 [(Theodore J., Center for Orbital and Reentry Debris Studies, Center for Space Policy and Strategy, The Aerospace Corporation, 30 year Space Systems Analyst and Operator, Marlon E. Sorge, Jamie Morin, Robert S. Wilson), “Space traffic management in the new space era,” Journal of Space Safety Engineering, 6/18/19, <https://doi.org/10.1016/j.jsse.2019.05.007>] TDI

The last decade has seen rapid growth and change in the space industry, and an explosion of commercial and private activity. Terms like NewSpace or democratized space are often used to describe this global trend to develop faster and cheaper access to space, distinct from more traditional government-driven activities focused on security, political, or scientific activities. The easier access to space has opened participation to many more participants than was historically possible. This new activity could profoundly worsen the space debris environment, particularly in low Earth orbit (LEO), but there are also signs of progress and the outlook is encouraging. Many NewSpace operators are actively working to mitigate their impact. Nevertheless, NewSpace represents a significant break with past experience and business as usual will not work in this changed environment. New standards, space policy, and licensing approaches are powerful levers that can shape the future of operations and the debris environment. 2. Characterizing NewSpace: a step change in the space environment In just the last few years, commercial companies have proposed, funded, and in a few cases begun deployment of very large constellations of small to medium-sized satellites. These constellations will add much more complexity to space operations. Table 1 shows some of the constellations that have been announced for launch in the next decade. Two dozen companies, when taken together, have proposed placing well over ~~20,000~~ [twenty thousand] satellites in orbit in the next ~~10~~ [10]years. For perspective, fewer than ~~8100~~[eight thousand one hundred] payloads have been placed in Earth orbit in the entire history of the space age, only 4800 [1] remain in orbit and approximately 1950 [2] of those are still active. And it isn't simply numbers – the mass in orbit will increase substantially, and long-term debris generation is strongly correlated with mass. [Table 1 Omitted] This table is in constant flux. It is based largely on U.S. filings with the Federal Communications Commission (FCC) and various press releases, but many of the companies here have already altered or abandoned their original plans, and new systems are no doubt in work. Although many of these large constellations may never be launched as listed, the traffic created if just half are successful would be more than double the number of payloads launched in the last 60 years and more than 6 times the number of currently active satellites. Current space safety, space surveillance, collision avoidance (COLA) and debris mitigation processes have been designed for and have evolved with the current population profile, launch rates and density of LEO space. By almost any metric used to measure activity in space, whether it is payloads in orbit, the size of constellations, the rate of launches, the economic stakes, the potential for debris creation, the number of conjunctions, NewSpace represents a fundamental change. 3. Compounding effects of better SSA, more satellites, and new operational concepts The changes in the space environment can be seen on this figurative map of low Earth orbit. Fig. 1 shows the LEO environment as a function of altitude. The number of objects found in each 10 km “bin” is plotted on the horizontal axis, while the altitude is plotted vertically. Objects in elliptical orbits are distributed between bins as partial objects proportional to the time spent in each bin. Some notable resident systems are indicated in blue text on the right to provide an altitude reference. The (dotted) red line shows the number of objects in the current catalog tracked by the U.S. Space Surveillance Network (SSN). All the COLA alerts and actions that must be taken by the residents are due to their neighbors in the nearby bins, so the currently visible risk is proportional to the red line. The red line of the current catalog does not represent the complete risk; it indicates the risk we can track and perhaps avoid. A rule of thumb is that the current SSN LEO catalog contains objects about 10 cm or larger. It is generally accepted that an impact in LEO with an object 1 cm or larger will cause damage likely to be fatal to a satellite's mission. Therefore, there is a large latent risk from unobserved debris. While we cannot currently track and catalog much smaller than 10 cm, experiments have been performed to detect and sample much smaller objects and statistically model the population at this size [3]. The (solid) blue line represents the model of the 1 cm and larger debris that is likely mission-ending, usually called lethal but not trackable. If LEO operators avoid collisions with all the objects in the red line, they are nonetheless inherently accepting the risk from the blue line. This risk is already present. The (dashed) orange line is an estimate of the population at 5 cm and larger and is thus an estimate of what the catalog might conservatively be a few years after the Space Fence, a new radar system being built by the Air Force, comes on line (currently planned for 2019) [4]. Commercial companies offering space surveillance services, such as LeoLabs, ExoAnalytics, Analytic Graphics Inc., Lockheed, and Boeing, might also add to the number of objects currently tracked. Space Policy Directive 3 (SPD-3) [13] specifically seeks to expand the use of commercial SSA services Existing operators can expect a sharp increase in the number of warnings and alerts they will receive because of the increase in the cataloged population. Almost all the increase will come from newly detected debris [5]. The pace of safety operations for each satellite on orbit will significantly change because of the increase in the catalog from the Space Fence. This effect is compounded because the NewSpace constellations described in Table 1 will drastically change the profile of satellites in LEO. The green bars in Fig. 1 represent the number of objects that will be added to the catalog (red or orange lines) from only the NewSpace large LEO constellations at their operational altitudes. This does not include the rocket stages that launch them, or satellites in the process of being phased into or removed from the operational orbits. Neighbors of one of these new constellations may face a radically different operations environment than their current practices were designed to address. Satellites in these large LEO constellations typically have planned operational lifetimes of 5–10 years. Some companies have proposed to dispose of their satellites using low thrust electric propulsion systems, which would spiral satellites down over a period of months or years from operating altitudes as high as 1500 km through lower orbits where the Hubble Space Telescope, the International Space Station, and other critical LEO satellites operate [6]. Similar propulsive techniques would raise replacement satellites from lower launch injection orbits to higher operational orbits. These disposal and replenishment activities will add thousands of satellites each year transiting through lower altitudes and posing a risk to all resident satellites in those lower orbits. More importantly, failures will occur both among transiting satellites and operational constellations, potentially leaving hundreds more stranded along the transit path.

**Probability – 0.1% chance of a collision.**

**Salter 16** [(Alexander William, Economics Professor at Texas Tech) “SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS” 19 STAN. TECH. L. REV. 221 \*numbers replaced with English words] TDI

The probability of a collision is currently low. Bradley and Wein estimate that the maximum probability in LEO of a collision over the lifetime of a spacecraft remains below one in one thousand, conditional on continued compliance with NASA’s deorbiting guidelines.3 However, the possibility of a future “snowballing” effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

**Time frame – Kessler effect 200 years away**

**Stubbe 17** [(Peter, PhD in law @ Johann Wolfgang Goethe University Frankfurt) “State Accountability for Space Debris: A Legal Study of Responsibility for Polluting the Space Environment and Liability for Damage Caused by Space Debris,” Koninklijke Brill Publishing, ISBN 978-90-04-31407-8, p. 27-31] TDI

The prediction of possible scenarios of the future evolution of the debris p o p ulation involves many uncertainties. Long-term forecasting means the prediction of the evolution of the future debris environment in time periods of decades or even centuries. Predictions are based on models84 that work with certain assumptions, and altering these parameters significantly influences the outcomes of the predictions. Assumptions on the future space traffic and on the initial object environment are particularly critical to the results of modeling efforts.85 A well-known pattern for the evolution of the debris population is the so-called Kessler effect’, which assumes that there is a certain collision probability among space objects because many satellites operate in similar orbital regions. These collisions create fragments, and thus additional objects in the respective orbits, which in turn enhances the risk of further collisions. Consequently, the num ber of objects and collisions increases exponentially and eventually results in the formation of a self-sustaining debris belt aroundthe Earth. While it has long been assumed that such a process of collisional cascading is likely to occur only in a very long-term perspective (meaning a time 1 n of several hundred years),87 a consensus has evolved in recent years that an uncontrolled growth of the debris population in certain altitudes could become reality much sooner.88 In fact, a recent cooperative study undertaken by various space agencies in the scope of i a d c shows that the current l e o debris population is unstable, even if current mitigation measures are applied. The study concludes:Even with a 90% implementation of the commonly-adopted mitigation measures [...] the l e o debris population is expected to increase by an average of 30% in the next 200 years. The population growth is primarily driven by catastrophic collisions between 700 and 1000 km altitudes and such collisions are likely to occur every 5 to 9 years.89

#### No war over satellites

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

Space is often an afterthought or a miscellaneous ancillary in the grand strategic views of top-level decision-makers. A president may not care that one satellite may be lost or go dark; it may cause panic and Twitter-based hysteria for the space community, of course. But the terrestrial context and consequences, as well as the political stakes and symbolism of any exchange of hostilities in space matters more. The political and media dimension can magnify or minimise the perceived consequences of losing specific satellites out of all proportion to their actual strategic effect.

#### Turn - space debris creates existential deterrence and a taboo

Bowen 18 [(Bleddyn, lecturer in International Relations at the University of Leicester) “The Art of Space Deterrence,” European Leadership Network, February 20, 2018, <https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/>] TDI

Fourth, the ubiquity of space infrastructure and the fragility of the space environment may create a degree of existential deterrence. As space is so useful to modern economies and military forces, a large-scale disruption of space infrastructure may be so intuitively escalatory to decision-makers that there may be a natural caution against a wholesale assault on a state’s entire space capabilities because the consequences of doing so approach the mentalities of total war, or nuclear responses if a society begins tearing itself apart because of the collapse of optimised energy grids and just-in-time supply chains. In addition, the problem of space debris and the [political-legal hurdles to conducting debris clean-up](https://doi.org/10.1080/14777622.2014.890489) operations mean that even a handful of explosive events in space can render a region of Earth orbit unusable for everyone. This could caution a country like China from excessive kinetic intercept missions because its own military and economy is increasingly reliant on outer space, but perhaps not a country like North Korea which does not rely on space. The usefulness, sensitivity, and fragility of space may have some existential deterrent effect. [China’s catastrophic anti-satellite weapons test in 2007](https://defenceindepth.co/2017/01/11/chinas-space-weapons-test-ten-years-on-behemoth-pulls-the-peasants-plough/) is a valuable lesson for all on the potentially devastating effect of kinetic warfare in orbit.