

Mining the high frontier: sovereignty,
property and humankind's common heritage
in outer space



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Cover image:

The view from Apollo 17, looking over the lunar horizon towards a crescent Earth (NASA 1972a).

Certificate of original authorship

I, Matthew Robert Johnson, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Arts and Social Sciences at the University of Technology Sydney.

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Abstract

Members of the ‘NewSpace’ network claim that exploiting the mineral resources of the Solar System is essential to humanity’s future, enabling the exploration and settlement of the cosmos and resolving ecological crises on Earth. NewSpace’s techno-utopian justification for colonising the ‘high frontier’ is often infused with a vision of stateless libertarianism. Arguing that government space programs have failed to build on the heroic achievements of the Apollo Moon landings, NewSpace lobbies for their displacement by commercial enterprise, with the hope of instantiating a new era of entrepreneurial space exploration. A significant milestone in this project has recently been achieved: the United States has unilaterally passed laws that pre-emptively guarantee the claims of US corporations to own and sell space resources. Yet in 1967, the UN *Outer Space Treaty* declared that the exploration and use of outer space should be ‘for the benefit of all mankind’ and ‘not subject to national appropriation’ by sovereign claim. In this dissertation, I argue that private property rights to space resources contravene international space law, pre-emptively projecting state powers of appropriation – manifest in privately-held mining rights – onto the extra-territorial and extra-terrestrial frontier. The histories of frontier resource appropriations, mining law and spacefaring reveal indistinctions between national sovereignty and corporate power that are obscured in NewSpace discourse. Far from offering a stateless space utopia, the NewSpace colonisation project exemplifies the ‘strong state, free economy’ aporia of neoliberalism. As a case study in political economy and legal geography, the anticipatory expansion of private property claims beyond the Earth both resonates with and problematises the ‘terrain’ of political history, such as the tensions between states and markets, public law and private power, ‘the commons’ and exclusive property. As a work of historical sociology, I demonstrate that NewSpace cosmopolitics mirrors (and is often explicitly embedded in) neoliberal geopolitics, prompting urgent questions about how we can reaffirm principles of democracy and ‘common heritage’ in the international laws of Earth and space.

Introduction



Figure 1: The 'Blue Marble' photograph, taken by Apollo 17 in 1972 (NASA 1972b)

“Our central and driving goal is the large-scale permanent settlement of space as soon as possible, using the resources we find there, and the imaginations we bring to the task.

We believe all people have the ‘right stuff’ and that everyone will benefit from opening the space frontier. Given the fragility of our planet we also believe that it is vital that we not only preserve the biosphere of earth using the resources of space, but that we expand that biosphere, taking life to worlds now dead. If successful, we see our future as exciting and full of possibility.

We reject the ideas that the world’s greatest moments are in its past, that the advancement of our technological civilization must mean the decline of our ecosystem, and we are determined to transform the image held by many that the future will be worse than the present.

We believe that free people, free markets and free enterprise will become unstoppable forces in the irreversible settlement of this new frontier, and that our world is on the verge of a truly historic breakthrough – access to space for all.

To make that happen, we are engaged in the transformation of space from a government-owned bureaucratic program – into a new partnership between the public and private sectors – that will lead to a dynamic and inclusive frontier open to all people.”

– Space Frontier Foundation (in Tumlinson 2003)

“And hereupon, The Earth (which was made to be a Common Treasury of relief for all, both Beasts and Men) was hedged in to In-closures by the teachers and rulers, and the others were made Servants and Slaves: And that Earth that is within this Creation made a Common Store-house for all, is bought and sold, and kept in the hands of a few, whereby the great Creator is mightily dishonoured, as if he were a respecter of persons, delighting in the comfortable Livelihoods of some, and rejoicing in the miserable povertie and straits of others. From the beginning it was not so.”

– Gerrard Winstanley (1649), *The True Leveler’s Standard Advanced*

i. NewSpace and the enclosure of the space commons

In 1972, on their journey towards the Moon, Apollo 17 astronauts Eugene Cernan, Ronald Evans and Harrison Schmitt took what became known as the ‘Blue Marble’ photograph (Figure 1, above). The image captured Earth as a full globe for the first time, looking down upon the continents of Africa, Asia and Antarctica, with the resplendence and fragility of Earth illuminated against the pitch-black void of outer space. The Apollo Program’s images of Earth-from-space conjure a sense of cosmopolitan reverie and planetary ecological consciousness. The beautiful mosaic of expansive oceans, diverse biomes and dynamic climates renders invisible the social, political and economic antagonisms that reign on the surface. Much like Gerrard Winstanley’s view from Saint George’s Hill in 17th century England, the view of Earth from space might reveal a ‘common treasury of relief for all’, appearing to be void of exclusive ownership, hinting at shared human futures and a common home.

The photo was taken when environmental protection emerged as a global prerogative, in the same year that the United Nations declared that humankind “bears a solemn responsibility to protect and improve the environment for present and future generations” (U.N. Conference on the Human Environment 1972, p.4). This ‘Apollonian gaze’ looking down upon Nature invokes both stewardship and mastery, humility and omnipotence (Jazeel 2011, p.82; Cosgrove 2001). A marriage of benevolence and belligerence, these first photographs of Earth from space were made possible by the embedding of the Apollo Program within Cold War geopolitics and the American military-industrial complex.

‘We came in peace for all mankind...’. So says the romantic, cosmopolitan message inscribed on a plaque left on the Moon by NASA’s Apollo 11 mission, three years before the Blue Marble photo was taken. The plaque serves as a testament to the militarised capitalist-communist rivalry of the Cold War, at least as much as it does to magnanimous pretences of species consciousness or planetary unity. The plaque’s egalitarian sentiment is perhaps undermined by its androcentric language and the fact that it reached the Moon through a space agency characterised by a male-dominated, WASP monoculturalism (Mailer 1970). Beneath the names of the Apollo 11 astronauts Neil Armstrong, ‘Buzz’ Aldrin and Mike Collins, the lunar plaque bears the signature of one Richard Milhous Nixon. Under Nixon’s presidency, the US simultaneously claimed ‘soft power’ rewards for its Moon landing feat and secretly bombed Cambodia. Aerospace manufacturer Boeing had built both the first-stage booster of the Saturn V

rocket that powered Apollo 11 into cosmic hagiography and the ubiquitous B-52 bombers that levelled Indochina. Science communicator Carl Sagan (1934-1996) remarked:

“As the United States was dropping 7 ½ megatons of conventional explosives on small nations in Southeast Asia, we congratulated ourselves on our humanity: we would harm no one on a lifeless rock” (Sagan 1994, p.170).

Yet Sagan himself had some insider experience with military geopolitics. In the throes of the early Cold War, Sagan’s doctoral studies involved work on the unrealised Project A119, an Air Force project that considered detonating a hydrogen bomb on the Moon (Reiffel 1959; Davidson 1999). Project A119 was proposed shortly after the Soviet Union had beaten the US in launching *Sputnik* into space, the first artificial satellite. A nuclear explosion on the lunar terminator – the horizon where lunar day becomes night – was hypothesised to be visible from Earth and would have served as a bright and toxic ‘don’t tread on me’ in the wake of the first salvo in the Space Race (Davidson 1999).

Yet it was against this backdrop of Cold War nuclear pageantry when the solidarity of all humankind vis-à-vis outer space was first articulated in public international law.¹ By its 50th anniversary, the United Nations’ *Outer Space Treaty* (OST 1967) had been ratified by 105 nations.² It proclaims that:

“The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies” (OST 1967, Art. 1).

The OST regulates the behaviour of state and non-state actors in outer space, and proclaims principles of common interest, free passage, shared use, mutual benefit, reciprocal obligation and

¹ While ‘mankind’ is the exact wording of the *Outer Space Treaty* and several other instruments of international law, I have used ‘humankind’ when not directly quoting from these treaties, declarations and resolutions.

² Formally, the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (1967). A list of all cited legislative documents is provided in Appendix 1.

the rule of law in the use of outer space. While the precise meaning of this international legal instrument has been disputed, outer space is often considered *res communis*, or common property – from the edge of national airspace to the valuable geostationary orbit and on to celestial bodies like the asteroids, moons and planets of the Solar System.

Like the high seas, atmosphere and Antarctica, outer space is a commons – free to explore and open to all, but subject to restrictions on its use (though each of these global commons possesses different legal characteristics and levels of contestation). The Blue Marble imparts a sense of anxiety and foreboding when we consider the health of these Earthly commons. Our ‘common treasury’ has been plundered during the short, Anthropocene chapter of Earth’s 4.5 billion-year history. Earth is presently the only planet known to harbour biological life, and many might sympathise with Bill Bryson’s comment that “if you were designing an organism to look after life in our lonely cosmos...you wouldn’t choose human beings for the job” (Bryson 2005, p.593). Earth is an oasis suspended in the “great enveloping cosmic dark” (Sagan 1994, p.7), and is under threat from the irresponsibility of its apex species (or, at least, a handful of thermo-industrial predators). Since the industrial revolution, a level of biodiversity loss has occurred that rivals the mass extinction events of eons past. Anthropogenic carbon pollution is pushing global temperatures towards an imminent 2°C increase, which might tip Earth towards a catastrophic 4-6°C increase by 2100 – beyond this may lie an unliveable ‘hothouse Earth’ scenario of irreversible planetary warming (Steffen et al. 2018). Outer space is arguably the last commons to be subjected to some form of degradation, depletion and contestation.

For advocates in the ‘NewSpace’ network, however, the space frontier offers a salve for this planetary pessimism. Centred in the United States, NewSpace is a network of activists, entrepreneurs, commercial entities and civil society organisations that share the goal of furthering space exploration and settlement (Valentine 2012; Shammas & Holen 2019). This diffuse network involves pragmatic technoscientific and commercial elements, and a more grandiose belief that civilisation should not be limited by the bounds of gravity, atmosphere and biosphere (McCray 2013). The destiny of the human species is to continue expanding onto celestial bodies like the Moon, Mars and asteroids, even one day moving beyond the Solar System and traversing the expanses of the Milky Way galaxy. This expansive tendency in the NewSpace imaginary is perhaps better reflected in another photograph taken by the Apollo 17

crew – a distant Earth, dwarfed by the barren and cratered expanses of the Moon (NASA 1972; see title page). Many in the NewSpace network want to do more than launch satellites or send robotic probes to Mars. They want to find new homes amongst this ‘magnificent desolation’, as Apollo 11’s Buzz Aldrin once described it, aspiring for humanity to ascend from its home planet and colonise the ‘high frontier’ (O’Neill 1977). In the words of NewSpace progenitor Gerard O’Neill, outer space is to be ‘humanised’ (1977, p.230).

This thesis is an investigation into the NewSpace imaginary, which – despite its fantastic and speculative nature – is now grounded in the sovereignty of the United States. In November 2015, under a Republican-dominated Congress, President Obama signed into law the *Commercial Space Launch Competitiveness Act of 2015* (CSLCA). It states:

“A United States citizen engaged in commercial recovery of an asteroid resource or a space resource ... shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.”
(CSLCA 2015, s.51303).

The CSLCA would recognise the future private property claims on resources mined in space by US citizens and commercial entities, and whether the Act is in accordance with the US’s obligations under the OST shall be explored throughout this thesis. There is currently no property to recognise, for there are no realised space mining industries nor does anyone possess off-world minerals mined for commercial gain. More optimistic estimates suggest that the space mining industry is “probably a good 15 years off revenue” (Boywer, in Cornish 2017). Yet NewSpace’s dream of limitless spacefaring is now anchored in the politico-legal authority of the world’s reigning space superpower, manifest in this extra-territorial guarantee of mineral rights.³ This law may yet play a role in realising the NewSpace dream of space colonisation. In 2017,

³ Others have tried to introduce off-world property ownership, though without the legal recognition of nation states or international governmental organisations. Owning extra-terrestrial ‘property’ might be as simple as visiting the website of Lunar Embassy...For the low price of US \$25, one can buy a certificate allocating them an acre of real estate on the Moon, Mars, Mercury or Venus. Property title on Venus – a planet named for the Roman goddess of love but later revealed to be a toxic furnace with a greenhouse atmosphere of 96% carbon dioxide – may or may not represent “the ultimate romantic gift” (Lunar Embassy 2019a). The Embassy’s owner, Dennis Hope, attempts to reassure any sceptical customers that their extraterrestrial title is recognised and protected by the sovereignty of the ‘Galactic Government’, of which Hope has declared himself Galactic President (Lunar Embassy 2019b).

Luxembourg, a small European nation known for its generous tax laws, became the second country to introduce space mining legislation. Other countries may soon follow suit.

Why would anyone want to own private property in space resources? In the NewSpace imaginary, commercial exploitation of the mineral reserves of the Solar System is considered an essential step in space colonisation (e.g. OffWorld, n.d.; Lewis 1997). In order to leave Earth's gravity well, contemporary rockets need to achieve an escape velocity of approximately 11.2 km per second or 40,000km per hour. This feat necessitates large volumes of heavy and expensive rocket propellant. The cost of transporting material from Earth's surface to low-Earth orbit can be as high as US \$23,000 per pound of payload (Planetary Resources 2014). Celestial bodies of the Solar System are thought to contain vast amounts of valuable minerals, including the platinum group metals, iron, nickel and even just water ice. Exploiting these reserves in space would negate the need to transport them from Earth's surface. Metals and alloys could be used for building large spacecraft and habitats that could never be launched from the depths of Earth's gravity well. Water ice from asteroids and the Moon could be used as astronaut life supports. If this water was separated into hydrogen and oxygen, it could become rocket propellant – turning asteroids into off-world 'coaling stations' for journeys into deep space.⁴ In anticipation of off-world rewards, a handful of space mining start-up firms have been established.

NewSpace considers off-world resource exploitation to be more than a means of living out one's sci-fi fantasies (though this still appears to have some appeal). In 1977, Princeton physicist Gerard O'Neill published *The High Frontier*. He developed a detailed schema for space colonisation and justified this off-world expansionist project by drawing on then emerging environmentalist discourses (O'Neill 1977). NewSpace continues to argue that ecological crises caused by overpopulation, unfettered economic growth and resource depletion are surmountable if the space frontier is colonised and industrialised (e.g. Orsulak 2018). More recent articulations of NewSpace environmentalism propose the exploitation of helium-3, for example. Rare on Earth but abundant on the Moon, helium-3 is considered a potential ingredient in the elusive technology of controlled fusion reactions – it could enable unlimited clean energy production

⁴ This dissertation focuses primarily on space mining and space colonisation as these projects appear in NewSpace discourse. However, there are a range of space industries that could be categorized as 'NewSpace', including companies focused on rocket manufacturing and launch services like Elon Musk's SpaceX, space tourism firms like Richard Branson's Virgin Galactic, and highly specialised engineering start-ups like Made In Space (who are developing microgravity applications of 3D printing technology).

(Schmitt 2006). Off-world colonisation is also seen by some as a ‘Plan B’ in the event of planetary apocalypses that aren’t self-inflicted, such as a meteor impact (Diamandis, in Hoffman 2010). Through these currently unrealised technologies of off-world industrialisation – space mining, *in situ* resource refinement and microgravity manufacturing – NewSpace believes that society and economy can (and need to) become independent of Earth.

Apollo 17’s 1972 mission to the Moon represented the end of the Apollo Program. Much to the chagrin of many in the NewSpace network, no human has set foot on a celestial body since – there is no one there to read Apollo 11’s famous plaque. Since the NewSpace movement’s genesis in the wake of Apollo, NewSpace actors have often mounted libertarian or anti-statist arguments that the government-centred legacy of the Cold War should be displaced by a new era of commercial spacefaring, or the role of government reduced to supporting space businesses (e.g. Hudgins 2002; *Orphans of Apollo* 2008; NSS 2019). If the vision of infinite expansion and eternal exploration is to materialise, it is “free people, free markets and free enterprise [that] will become unstoppable forces in the irreversible settlement of this new frontier” (Space Frontier Foundation, in Tumlinson 2003).

Like the view of Earth from space, NewSpace cosmopolitics is rife with tension and paradox. It offers both an exotic, eschatological vision and a familiar orientation towards government, social obligation and ecological crisis. Planetary constraints to unfettered industrialism can be overcome through the industrialisation of the limitless frontier and the limitless creativity of the technology entrepreneur. It is the commercial incentive of privately-ownable space resources – not solidarity with or reciprocal obligations to ‘all mankind’ – that they believe will propel humanity toward an eternal space-faring future.

In this dissertation, I ask the following questions: is the *Commercial Space Launch Competitiveness Act* (CSLCA) legal under international law? Are there any historical precedents for the allocation of mining rights in extra-territorial spaces? If NewSpace managed to migrate elsewhere in the Solar System, would the rest of us be worse off? What, really, is at stake in a project that may not take place in the next half-century, and would occur *well* beyond the life-sustaining commons of Earth? I will argue that the private property rights guaranteed under the CSLCA actually undermine NewSpace’s cosmopolitan, humanitarian and environmentalist impulses. The space mining project would not entail the universal beneficence envisioned in NewSpace discourse, nor will it offer a plausible resolution to the problems we face on Earth. I

will demonstrate that NewSpace has numerous ideological, programmatic and social affinities with neoliberalism – a political philosophy fundamentally opposed to notions of common or public goods.

Despite NewSpace’s claims to ‘newness’, the legal-institutional structures emerging in anticipation of space mining evoke a much deeper historical trajectory. The legal guarantee of privately held mineral rights, projected onto a new frontier, conjures the age of maritime colonialism. The US’s imposition of private property law upon the Solar System represents a pre-emptive enclosure of the space commons, where spaces and resources that were once open for public use become the private property of some to the exclusion of others. Yet despite these historical parallels, it represents very different ‘terrain’ for law, politics and economy. Outer space is the last frontier to be subject to the ravages of industrial capitalism. Will we go in peace, or in avarice?

ii. Theory and method

My dissertation is an interdisciplinary engagement with the legal geography of common and private property rights, the political economy of neoliberalism and scholarship in international space law. However, it is primarily a work of historical sociology: my aim is to contextualise the NewSpace commercial-colonisation project within the broader currents of Earthly social and political history, and to explore how this historicisation opens up new and interesting questions for the social sciences.⁵ NewSpace may initially appear to present a harmless and discrete utopian imaginary, but I will argue that its contradictory impulses speak to core tensions in the history of (neo)liberal capitalism. I will demonstrate that the anticipatory contestation over the space commons mirrors the more immediate contestation over the global commons of Earth, such as the atmosphere. I will also explore some legal-institutional proposals that might resolve or prevent ‘tragedies of the commons’ on Earth and in the Solar System (Hardin 1968).

The social science literature on NewSpace is generally sparse, but it is valuable for approaching the subjectivities and social history of this network. However, most of this work has

⁵ While I make occasional reference to commercial space activity outside of the United States (in particular to Russia and Luxembourg, the United States’ traditional rival in space and the first nation to follow its lead in domestic space resources law, respectively), this dissertation is weighted towards American NewSpace. This is due in large part to NewSpace’s American locus and the US’s position as ‘first movers’ in off-world private property rights.

been published prior to the advent of the CSLCA (e.g. Michaud 1986; Launius 2003; McCray 2013). Kilgore (2003) appropriately locates the NewSpace imaginary within science fiction literary traditions – Robert Heinlein’s libertarian ‘boys’ novels’, for instance. Ormrod’s (2007) psychoanalytic approach describes NewSpace justifications for space colonisation as narcissistic male phantasies of mastery and omnipotence. However, the NewSpace imaginary is now supported by domestic public law and, through the CSLCA, space futures are now entwined within broader, enduring narratives of political history: the enclosure of common spaces, extra-territorial projections of national sovereignty and the blurred distinctions between state power and private ownership in neoliberalism and broader property law.

There is a surprisingly well-established field of legal scholarship concerning the question of off-world private property (e.g. Scheraga 1987; Pop 2000; Cooper 2003). There are numerous papers that have been published since the CSLCA was signed into law, however no consensus exists as to whether this specific law is legal under the terms of *Outer Space Treaty* (Tronchetti 2015; Kfir & Perry 2017; Freeland 2017; Jakhu, Pelton & Nyampong 2017). Some scholars in favour of the CSLCA have recently argued that it is legal to extract mineral resources in space so long as celestial bodies themselves are not appropriated by private economic interests (e.g. Kfir 2016; Perry 2017). In my view, these authors have failed to resolve the tension between private resource ownership and the ‘non-appropriation principle’ of the *Outer Space Treaty* (OST). According to Article 2 of the OST: “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 1967, Art.2).

Can we demarcate acts of private appropriation from ‘national appropriation’, if the legal recognition of private ownership claims is grounded in national sovereignty? I explore this question using an institutional political economic approach, detailing the relationship between states and markets that has existed since the dawn of capitalism. Using primarily online archival research, I analyse NewSpace political discourse through a range of texts: company press releases and advertisements; policy recommendations from civil society organisations; and other published communications from NewSpace actors (e.g. O’Neill 1977). NewSpace can be seen mirroring several tenets of Silicon Valley start-up culture, particularly the libertarian emphasis on individual rights secured against government interference (Barbrook and Cameron 1996; Parker 2009). NewSpace actors often frame private property, individual liberty and free markets

as the freedom *from* government intervention – and do so from a largely ahistorical viewpoint. Prior sociological research into NewSpace has also identified a dominant libertarian or economic liberal ideological strain within the movement (Launius 2003; Ormrod 2009; Parker 2009; Valentine 2012; Shammass & Holen 2019). In order to contrast this evident goal of an off-world libertarian utopia against its apparent reliance on state-backed private property rights, I turn to Karl Polanyi's *The Great Transformation* (2001 [1944]). Polanyi presented an economic history of market capitalism and an anthropology of economic liberalism that revealed 'free' markets to be entirely mythical: capitalistic freedoms are instead reliant on continuous government intervention (Polanyi 2001).

In this light, is it accurate to describe NewSpace as a 'libertarian' movement? Polanyi's work is valuable in approaching the role of the state in neoliberal government, and NewSpace is an intriguing case study in the era of neoliberal globalisation (projected beyond the globe, in this case). 'Neoliberalism' is a term that is often deployed with imprecision or lampooned as a leftist 'political swearword' (Hartwich 2009). For many, neoliberalism might be synonymous with de-regulation, the reduction of 'red tape' and an end goal of 'small government'. However, NewSpace exemplifies what has been described as the 'double truth' or aporia at the heart of neoliberalism (Mirowski 2013; Dean 2014). On the one hand, neoliberal actors espouse an outward hostility toward 'big government' and the reciprocal obligations to society that democratic government entails (taxation, resource rents and the preservation of commons, for example); on the other, the neoliberal political project has sought to capture these same public institutions and re-engineer their functions in order to serve private over collective interests. Neoliberalism is closer to 're-regulating' than de-regulating (Cahill 2014; Block & Somers 2014). Polanyi (2001) had identified capitalism's reliance upon government as early as the first waves of Enclosure laws that swept across the English countryside 400 years ago. This 'statecraft', as he called it, engendered the development of infrastructure, provision of subsidies or seed investments, and the introduction (or removal) of particular legal architectures in order to make corporations profitable. I will provide evidence of NewSpace's reliance on similar institutional supports, primarily through a theoretical investigation of the nature of private property rights and quantitative data that highlights other supports for the nascent space mining industry (e.g. FPDS 2018a).

I am not the first researcher to identify ideological and programmatic affinities between the commercialisation of space activity and neoliberalism (Valentine 2012; Weeks 2012; Genovese 2017; Rowan 2018; Shammass & Holen 2019). In addition to investigating NewSpace as an expression of neoliberal political-economic theory, however, my project offers a ‘networked history’ that investigates the extent to which NewSpace cosmopolitics is explicitly embedded within neoliberal political networks – to this end, I draw on Phillip Mirowski and Dieter Plehwe’s volume, *The road from Mont Pelèrin: The making of the neoliberal thought collective* (2009).⁶ Mirowski, Plehwe and their contributors highlight that – while neoliberalism may sometimes appear to have nebulous or contradictory philosophical tenets, and is realised in diverse and variable socio-political contexts – the neoliberal policy programme has been propagated by a consistent and organised collection of individuals and institutions. Founded in 1947 by Friedrich Hayek, among others, the Mont Pelèrin Society is the taproot of the transnational neoliberal collective. Since 1981, this collective has been extended and consolidated in local political forms through the Atlas Network, a coordinated array of over 475 think-tanks, academic departments and other interest groups across the globe (Atlas Network 2018).

By looking at neoliberalism through the institutional nodes and political-economic links of the Atlas Network, we can draw together a range of actors that have evangelised neoliberal ideology or funded its proliferation. As applied in diverse policy arenas, the political infrastructure of the Atlas Network commonly involves: the deployment of ‘conservative’ or ‘free market’ lobbying and advocacy organisations, such as the US’s Heritage Foundation or Australia’s Institute for Public Affairs (IPA); corporate philanthropy, particularly from industrial magnates who have waged war on environmental policy (the Koch brothers or Gina Rinehart, for example); and the embedding of former Atlas employees within public sector institutions and the chambers of democratic government (such as former Heritage policy wonks employed in ambassadorial positions by the Reagan Administration, or the election of former IPA staffers to the Australian Parliament). Since the neoliberal revolutions of the Thatcher, Reagan and Howard governments (among others), neoliberal policies have removed regulatory and institutional

⁶ I am reticent to use the term ‘social network analysis’ or network ‘mapping’, since these methodologies generally involve quantitative analysis or visualisation techniques that are perhaps less appropriate for the diffuse, multi-sector NewSpace network which encompasses entrepreneurialism, ‘grassroots’ advocacy, public sector space officials and mainstream lobbyist networks.

protection for workers, marginalised socioeconomic groups, the environment and future generations, while converting public assets and services into privately-owned fiefdoms.

To what extent can we treat NewSpace as an expression of neoliberal capitalism, and what points of confluence exist between American NewSpace and the Atlas Network? Using publicly available qualitative and quantitative data, I trace the history of NewSpace and the road to the CSLCA, and identify linkages between this seemingly idiographic techno-utopian network and key nodes in Atlas Network neoliberalism (the Heritage Foundation, Cato Institute and venture capitalist Peter Thiel, for instance). In addition to the above textual sources, I have also used Congressional transcripts, lobbying expenditures collated by the Center for Responsive Politics (2018) and space mining start-ups' (limited) publicly-available financial data (e.g. Crunchbase 2019a).⁷ My primary research has identified moments of confluence between the Atlas and NewSpace networks, such that neoliberal political agency can be seen influencing the passage of the CSLCA and other US positions on international space law – particularly the ill-fated UN *Moon Agreement* (1979).⁸ Committed to continuous economic growth, Atlas organisations have played a significant role in the obstruction of coordinated responses to climate change and the entrenchment of corporate rights to appropriate from mineral commonwealths. Links between Atlas and the passage of the CSLCA would suggest that the space commons will be enclosed for the benefit of wealthy 'cosmic elites' (Dickens & Ormrod 2007), not for the 'benefit of all mankind', while also casting doubt on NewSpace's environmentalist claims.

While Polanyi's institutional political economy and the 'neoliberalism as network' approach of Plehwe and Mirowski are helpful for characterising NewSpace, these theories are unable to convey how momentous the CSLCA may prove to be in political-economic history. Private property rights – the core legal architecture of market capitalism – are being projected into the extra-terrestrial and extra-territorial spaces of the Solar System, a frontier that only 12 American astronauts have ever set foot on. As a way of framing the significance of the CSLCA, I will draw on German jurist Carl Schmitt's *Der Nomos der Erde* (*The Nomos of the Earth*, 2003).

⁷ Given the ubiquity of start-up firms in the NewSpace industry, access to economic data describing the nascent space mining sector is more limited than it is with publicly traded companies. There have been no initial public offerings of shares in space mining start-ups, for example, and as such there is no data on firms' share prices or market capitalisation, nor are there obligations for annual financial reporting.

⁸ Formally, the *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (1979). It is sometimes referred to as the 'Moon Treaty', though I have used *Moon Agreement* throughout.

Reappraising the ancient Greek term for spatial law or order – *nomos* – Schmitt describes the origins of *all* law in the fundamental act of land appropriation. The off-world frontier awaits this foundational act from which both national sovereignty and private property have historically derived.

What is the significance of the CSLCA for the future *nomos* of the Solar System? This is a rapidly developing arena in law and politics. Masson-Zwaan and Palkovitz (2017) note that states' legal practice on space resources law is evolving. Perhaps owing to the sheer practical challenges involved in conducting profitable off-world mining, opposition to the CSLCA has been limited to a handful of state and non-state actors (Masson-Zwaan & Palkovitz 2017, pp.14-16; Tronchetti & Liu 2018, p.430, FN 4). In attempting to ascertain exactly what impact the CSLCA will have, sociologists, lawyers and law-makers are inevitably drawn into speculating on how space resources law and the actual practice of space mining will transpire. In contextualising the anticipatory project of space mining within the history of Earthly *nomoi*, I will argue that the CSLCA heralds both a new chapter in the genealogy of international law and a recapitulation of the imperialist projects of centuries past, undermining the OST's fundamental principles of equality and cooperation in the process.

While I engage with legal scholarship on the topic of private resource ownership in outer space, I do so primarily from the perspective of the political and social sciences. I will explore space law interpretations of the OST and CLSCA, whilst also arguing that the barren expanses of outer space present fertile ground for political economy, resonating with and problematising the 'terrain' of political history. This thesis investigates what happens when we extend political categories of property, sovereignty and freedom onto a frontier that is devoid of 'land', in the life-supporting sense that it has been known for tens of thousands of years of social history. The legal geographic and political economic questions I investigate are supported by research in the environmental humanities that has approached attempts to sustain human and non-human life in the utterly hostile, abiotic environments of outer space (e.g. Cooper 2007; Walker & Granjou 2017). Outer space subverts the environmentalist and social democratic animus that we would normally expect from the granting of expansive mining rights and laws of enclosure. While *terra nullius* was a lie of British colonialism, in space there is no life to destroy and no commoner to evict (as far as we are aware). For NewSpace and neoliberalism, outer space appears to represent an endless, guilt-free frontier for the pursuit of capitalist freedoms. What do traditional defences

of ‘common rights’ mean on an abiotic, frontier environment that has only been accessible to powerful techno-industrial elites?

iii. Ethical considerations

All of the primary sources cited in this dissertation were published online and were publicly available at the time of writing. This includes: online websites; digitised archival sources such as policy papers or newsletters; sources that have been made public due to legislative requirement (e.g. lobbying disclosures); and other public sources, such as company press releases. Use of these sources did not require formal review by the UTS Human Research Ethics Committee, according to policies current when the research was undertaken. No interviews, focus groups, surveys, polls, observations or any other form of participant research or personal data collection were used.

iv. Outline of the dissertation

In Chapter 1, I present a long-run historical sociology of NewSpace which explains the emergence of the nascent space mining industry and this contentious private property law. I pay particular attention to the *High Frontier* project of NewSpace progenitor Gerard O’Neill (1974; 1977). Responding to the first *Limits to Growth* report (Meadows et al. 1972), O’Neill presented space mining and colonisation as a techno-utopian solution to ecological crisis and did so with an anarcho-libertarian political ideology that continues to inform NewSpace. I set NewSpace’s political-economic history against the evolution of the neoliberal political network. What ideological and programmatic affinities can we identify in NewSpace and neoliberalism? How does NewSpace cosmopolitics challenge the egalitarianism and fairness envisioned under the *Outer Space Treaty* (OST 1967)?

In chapter 2, I focus on the legal geography of outer space and the OST’s non-appropriation principle (1967, Art. 2). The novelty of space mining and the utopianism of NewSpace mask what is ostensibly a well-worn narrative in human history: the enclosure of ‘the commons’ through private property rights and sovereign powers of appropriation. In keeping

with American libertarianism, NewSpace actors appear to invoke a natural law justification for individual rights to private property (Locke 2005 [1690]; Pilchman 2015). I critique this position by drawing on Karl Polanyi's (2001) institutional political economy of enclosure. The Polanyian account of state-backed private property is helpful in approaching the legality of the CSLCA and the broader questions of economic justice that are at play in the enclosure of the space commons. Yet outer space problematises traditional narratives of enclosure – what do categories of 'land' and 'property' mean in the micro-gravity expanses of the Solar System? How can we theorise authority and power on the uninhabited and landless frontier?

The CSLCA belongs to a different political history than private property in land. While mineral rights also derive from the sovereign authority to delegate private ownership within a given territory, the CSLCA evokes the enclosure of a different form of estate – the mineral commonwealth. The history of mining law reveals a much closer relationship between state power and private ownership rights than that of land tenure, and this further undermines claims that the CSLCA is legal under international law. In Chapter 3, I introduce the term 'mineral sovereignty' to excavate the entwined, subterranean genealogies of states, corporations and mineral rights (Walker & Johnson 2018). Mineral sovereignty denotes the constitutional authority to legitimise miners' access to mineral estates, and the apparent ability of mining firms to exert extra-parliamentary power over the jurisdictions in which they operate. What parallels can we draw between the history of mineral sovereignty and the CSLCA – such as sovereign claims to precious metals in pre-modernity or social democratic distributions of benefits from mineral estates of the 19th-20th centuries? What can the passage of the CSLCA tell us about contemporary democracy and the rule of law?

In chapter 4, I will describe the emergence of international space law – particularly the *Outer Space Treaty* (OST) – and legal characteristics of outer space as it emerged in dialogue with comparable regimes in international law, such as those governing the high seas. The OST represents an uneasy compromise between the interests of the US and the rest of the world in the space commons. Key principles of the OST emerged through the US's Cold War anticipatory geostrategy: the introduction of *mare liberum* ('free seas') rights to freely use global commons effectively safeguarded US corporate and military freedoms within these commons. In exploring the political-legal history of the OST, I describe it as the 'space constitution' – both in the sense that it acts as a foundational legal document from which common rights are derived and that it

seeks to constrain the exercise of state power (Gabrynowicz 2004; Waluchow 2017). While the commons of space are yet to be exploited on a material level, the very definition of celestial bodies as commons is being contested in the here and now (Hertzfeld, Weeden & Johnson 2016). I argue that NewSpace mining can thus be read as an agent of neoliberal constitutionalism (Gill 2002; Schneidermann 2013; Purdy 2014), whereby the commons ‘constitution’ of UN treaty law is effectively displaced with a pre-emptive and unilateral legal regime predicated on private ownership. NewSpace actors have argued that the universal rights prescribed under the OST actually support private mining operations: the freedom to use and explore space can be exercised by corporations under the competitive logic of market capitalism, nothing in the OST explicitly prohibits private ownership of space resources, and benefits from space mining will ‘trickle down’ to the rest of humanity in any case (e.g. Kfir & Perry 2017). What might this mean for future developments in international space resources law?

In Chapter 5, I position these questions of the space commons within an interesting episode of NewSpace myth-making. ‘The frontier’ is a particularly potent and well-worn trope in NewSpace discourse: as anomic spaces in which state authority is diminished, frontier myths feed into NewSpace’s libertarian patina (Parker 2009, pp.89-91). The NewSpace anti-statist narrative is most explicit in the documentary, *Orphans of Apollo* (2008), which I analyse as a case study in NewSpace mythology. The movie’s promotional material is evocative: the NewSpace protagonists describe themselves as a ‘rebel alliance of entrepreneurs’, brandishing the Jolly Roger flag of the pirate as they claim to reject government authority on the off-world frontier (Free Radical Productions 2008). There is some irony in invoking the pirate. I argue that the state guarantee of frontier property *does* reflect the age of maritime colonialism, but through the less rebellious figures of the privateer and the charter company – the commercial vanguards of Empire. What does this mean for NewSpace libertarianism? How far can we analogise space mining with the violence of the colonial frontier in the age of seafaring? Is space mining actually a benign form of colonialism, as is claimed in NewSpace narratives?

In Chapter 6, I return to NewSpace’s claims of environmentalism and link the off-world commons with environmental law on Earth. Gerard O’Neill’s techno-utopian environmentalism is perpetuated by NewSpace advocates and commercial entities, who optimistically reject the claim “that the advancement of our technological civilization must mean the decline of our ecosystem” (SFF, in Tumlinson 2003; see also Bezos, in Blue Origin 2019). Yet I will argue that

NewSpace environmentalism rests upon speculative techno-fixes, in which an off-world deliverance from ecological catastrophe rests upon the utter transcendence of biophysical limits. Consistent with neoliberal environmentalism, space mining will not provide remedies for ecological crisis but instead offers an elitist escape route from its consequences. How do we counter NewSpace's post-nature fantasies and their undermining of international laws of the global commons? Can we confront planetary ecological crises in a more pragmatic sense, while also working towards more inclusive uses of the off-world commons? I argue that Joseph Sax's (1969) work on the public trust doctrine might help us realise more responsible and equitable futures on Earth and in space. A means to go in peace for all Earthkind, as it were...

1. NewSpace and neoliberalism

The existence of private property law in outer space can be attributed to NewSpace advocacy and lobbying, the influence of actors within the Atlas Network and processes of neoliberalisation that have occurred within and around the United States' space program. What is NewSpace? Why do they want private property rights for space resources? In what ways does NewSpace cosmopolitics resonate with neoliberal ideology and policy? In this opening chapter, I present a long-run historical sociology that compares NewSpace with the neoliberal political project. This narrative begins with the entirely disparate pre-histories of neoliberalism and space exploration, then moves through key phases of the American space program in which NewSpace and neoliberalism can be seen converging. I will argue that NewSpace ideas about the role of the state in the American space programme reflect core ideological tenets of neoliberalism. In spite of a libertarian or *laissez-faire* veneer, neoliberal politics enlists a “strong state as both producer and guarantor of a stable market society” (Mirowski 2009, p.435). This is equally clear in NewSpace cosmo-politics, before we even consider the indispensable role of the state in securing private property rights.⁹

‘NewSpace’ is obviously a term of historical periodisation. Those who use it attempt to demarcate a new epoch of entrepreneur-led space innovation that has or will supplant the ‘old’ space era of government-centred space programmes. The ‘NewSpace’ label appears to originate in 2004 with the Space Frontier Foundation (SFF), a civil society organisation based in the United States (SFF 2018). The SFF are “dedicated to opening up the space frontier to everyone” and “changing the way we live and do business in space” (SFF 2018).¹⁰ The ‘old space’ era was characterised by Cold War geostrategic imperatives and massive state patronage and coordination of American space activity. Those who self-apply the NewSpace moniker see themselves as breaking the dominance of the National Aeronautics and Space Administration (NASA) and the massive arms and aerospace manufacturers like Boeing, Lockheed Martin and Northrop Grumman that it frequently contracts – an arrangement they describe as “the bureaucratic nature of the space program” (SFF 2018).

⁹ I focus on the legal geography of commons enclosure in Chapter 2.

¹⁰ The moniker has assumed an official air through the annual conference of the SFF, which has run annually since 2006 (SFF 2008).

Contemporary NewSpace is situated within a larger constellation of actors, beliefs and texts that could be loosely aggregated as ‘space enthusiasm’. ‘Pro-space’ has actually been the more widely used term in academic research, an umbrella term that links together diverse forms of space advocacy regardless of their individual ideologies or policy goals (Bainbridge 1976; Michaud 1986; Launius 2003; Dickens & Ormrod 2007; Ormrod 2007). Writing in 1986, historian Michael Michaud suggested that ‘pro-space’ was essentially “convenient shorthand” for these inter-related and often competing interests exhibited by a diverse group of advocates:

“It can refer to their support for larger and better government space programs; to a desire to see more activity by individuals, companies, nations, and the human species in the extraterrestrial realm; to a belief that the intelligent use of space offers solutions to national and world problems; or to a philosophical, even emotional conviction that human expansion into space is a natural and desirable next step in the evolution of life of Earth” (Michaud 1986, p.xx).

NewSpace’s commercial orientation makes it a distinct subset within this broader constellation of ‘pro-space’ advocates. As I will demonstrate in this chapter, contemporary space mining firms like Planetary Resources, Deep Space Industries and Moon Express¹¹ are an outgrowth of both the ‘pro-space’ philosophy and the specific commercial orientation of NewSpace.

NewSpace has historically been monocultural: its demography still leans towards affluent Caucasian men with backgrounds in IT, engineering and the natural sciences (Michaud 1986, pp.103-121; Valentine 2012, p.1047). There are established and emergent NewSpace nodes in Europe, the United Kingdom, Australia and other nations. However, the epicentre of NewSpace advocacy and industry is in the United States. While the NewSpace network is diffuse, such that I will refer to it as a ‘network’ as opposed to ‘community’ or ‘movement’, there are unifying precepts. Anthropologist David Valentine (2012) characterises the NewSpace imaginary as the “more expansive, positive, and indeed, *urgent* orientation toward a future of space settlement, with commercialization seen as the logical path towards this goal” (Valentine 2012, p.1049, emphasis in original). This future-oriented axiom is shared across a network of entrepreneurs, scientists, engineers, policy wonks, science fiction fans, advocates and the occasional Silicon Valley billionaire (Valentine 2012:1047). NewSpace “[celebrates] the spirit of exploration and individuality” while seeking to “open the space around us to human settlement” and “harvest the

¹¹ Moon Express has outlined plans for off-world resource exploitation; their business model, however, currently leans more toward lunar transportation and landing technologies (Moon Express n.d.).

resources of space” (Tumlinson 2003). In NewSpace ideology, humanity needs to colonise space and commerce is the way to do it.

Despite the apparent contradiction with their advocacy for commercialisation reforms, a core NewSpace rhetorical strategy is to background profit-making and instead emphasise the grander narrative of the off-world civilising mission. For example, here is Elon Musk articulating his priorities as owner and CEO of SpaceX:

“The reason I’m doing SpaceX is not because I think the rocket business is the easiest place to make money, it’s an extraordinarily difficult place to make money, and would be pretty low on the list of things you’d want to try if maximizing your wealth was your goal. But...I really want us to become a true space-faring civilization and ultimately be on a path to becoming a multi-planetary civilization and going out there and exploring the stars and making true the things that one sees in sci-fi movies and reads in books about the future. That’s my goal for SpaceX...” (2010, cited in Valentine 2012, pp.1060-61).

‘Making true’ the fantasies of science fiction consumed in their childhoods – this is a prominent motivation for many NewSpacers seeking to *personally* explore the stars (Ormrod 2007, p.264; O’Neill 1977, p.59). Robotic rovers or public-sector astronauts shouldn’t have all the fun, and the sci-fi inspirations of NewSpace seep into more pragmatic outputs. For example, SpaceX’s Falcon series of rockets derive their name from the ‘Millennium Falcon’, the spaceship of *Star Wars*’ smuggler Han Solo, the original renegade entrepreneur of outer space (Musk, in *HitRecord on TV* 2014). Robert Heinlein is a popular author amongst NewSpace advocates (e.g. Zubrin, in Riesman 2013). In *The Moon is a Harsh Mistress* (1966), a tale of lunar colonists revolting against an oppressive command economy, Heinlein introduced the expression, ‘there ain’t no such thing as a free lunch’. Milton Friedman, neoliberal economist and advisor to the Thatcher and Reagan governments, was a fan of that one too (Friedman 1993).

In my view, sociological investigations into NewSpace risk following the lead of NewSpace by treating the commercial orientation of this future imaginary as a discrete or ancillary element. My interpretation of NewSpace is indebted to the spacefaring histories of Michaud (1986), Kilgore (2003) and McCray (2013), among others. However, these researchers often relegate the political economy of space activity as secondary to ‘The Vision’. Kilgore’s work on ‘astrofuturism’, for example, is valuable in positioning NewSpace within “the tradition of speculative fiction and science writing inaugurated by scientists and science popularizers

during the space race” (2003, p.2). As such, his account is weighted towards literary cultures over policy developments. Ormrod’s (2007) psychoanalytical approach to broader pro-space movements reveals the narcissism of ‘needing’ to visit space and the fantasies of omnipotence and conquering that come with it. However, he seems to echo one of his NewSpace interviewees who claimed that the harnessing of commercial incentive was merely “window dressing” for the loftier goal of space settlement (Ormrod 2007, p.263). Legislative guarantees of private property rights are now part of the spacefaring zeitgeist – it is difficult to reconcile this with Ormrod’s summation that this movement is “constituted predominantly of people without any financial or political gain to be made from the success of their lobbying efforts” (2007, p.262).

My emphasis on NewSpace as a network with links to Atlas neoliberalism serves to augment previous research that describes this movement in related but imprecise terms, as either libertarian (Launius 2003; Ormrod 2009) or more generally as one component of ‘space capitalism’ (Dickens & Ormrod 2007; Parker 2009; Ellis 2016; Shammas & Holen 2019). Dickens and Ormrod (2007, p.4) have introduced the apt term ‘cosmic elite’ to describe how the space entrepreneur is the latest persona to be bestowed with cosmic privilege, like priests and shamans, Enlightenment astronomers and Cold War strategists. Their account of off-world capitalism invokes Marxist geographer David Harvey’s (2004) notion of the ‘spatial fix’ (see also Shammas & Holen 2019, p.3, p.5). While Dickens and Ormrod’s ‘outer spatial fix’ might explain a social network that seeks to bypass planetary limits to growth (2007, ch.2), this concept is too general for charting the movement towards a specific piece of legislation like the CSLCA. On this note, Genovese (2017, pp.77-84) investigates only a handful of specific case studies that might point to the neoliberalisation of the American space program (and counter-movements against this) – such as the 1973 Skylab astronauts ‘strike’ against surveillance and efficiency pressures placed on them by NASA. Parker (2009, pp.90-92), meanwhile, describes the libertarian attacks that space advocates have mounted on NASA and the US state, and draws attention to work of the Cato Institute (Hudgins 2002) in this process. However, his description of Cato as a ‘libertarian’ organisation (Parker 2009, p.91) fails to take into account the central aporia of neoliberalism, while also neglecting this think-tank’s centrality in the Atlas Network.

I will argue here that NewSpace and private property rights for space resources are manifestations of neoliberalism. This realisation is important for the future of the space commons. Atlas neoliberals have advanced a market-based antithesis to collectivism and social

democracy, and – as I will illustrate in this chapter – NewSpace actors have argued that individual liberties are threatened by any legal constraints imposed for the collective good. If the first movers into space colonisation have evident social, ideological and programmatic affinities with neoliberalism, it is unlikely that space exploration and settlement would proceed, in the words of the *Outer Space Treaty*, ‘for the benefit of all mankind’. Valentine aptly notes the resonance between NewSpace and neoliberal governmentality; he describes how the NewSpace project rests upon a model of government where the state is:

“...reduced to an enabler of private citizens’ and corporations’ economic objectives, with social good emerging from the activities of private actors (indeed, the removal of government restrictions, taxes and regulation is itself seen as a social good in this framework)” (2012, p.1054).

I will extend Valentine’s argument by comparing NewSpace political ideology with specific neoliberal concepts and arguments, such as neoliberal constitutionalism (Hayek 1986), the conflation of social democracy with totalitarianism, public choice theory (Buchanan & Tullock 1962) and the pursuit of market-based solutions to ecological crises (crises that are caused often by the market in the first place).

However, in Phillip Mirowski’s words, "neoliberalism turns out to be anything but an easily and clearly defined contemporary political philosophy once we venture beyond popular representations" (2009, p.421). As a way of cutting through the ambiguities and variabilities of neoliberal politics, I follow Mirowski and Dieter Plehwe’s (2009) ‘networked’ approach which emphasises that neoliberalism has been propagated through a particular set of individuals and institutions, now coordinated through the global Atlas Network. The entwined narrative I present here – the political sideshow of NewSpace set against the dominant economic paradigm of contemporary capitalism – culminates in the passage of the *Commercial Space Launch Competitiveness Act* (2015), where actors within the Atlas Network can be seen shaping US laws that will likely shape human futures in outer space.

1.1 1920s-1969: The pre-histories of NewSpace and neoliberalism

We will begin in the 1920s, by exploring the roots of NewSpace philosophy in the utopian writings of early rocket scientists and early neoliberal thought that developed in the same period. From here, we will explore the establishment of NASA in 1958 as a direct coordinator of the American space economy, and close with the climax of the Apollo Program (the first lunar landing in 1969). The pre-histories I present here are disparate, and the two movements develop through contrasting institutional frameworks. Neoliberalism forms around an opposition to socialism and centralised planning, while the early decades of spaceflight were spurred almost entirely by totalitarian technocracy and centrally coordinated research and development. There is an evident incongruity when NewSpace echoes neoliberal theorists in deriding government intervention in the market as socialistic (e.g. SFF 2006, p.17), when NASA's achievements in the 'old space' period were dependent on centralised bureaucracy (and mobilised against socialist rivals in the form of the USSR). By discussing early neoliberal thought, we can see ideological parallels between select appeals for 'constrained democracy' that have emerged in NewSpace, and the 'limited democracy' espoused by neoliberal philosopher Freidrich Hayek. The immediate post-war period is also when the Mont Pelèrin Society is founded by Hayek, Milton Friedman and other neoliberal economists – this organisation becomes the fountainhead of the contemporary Atlas Network.

1.1.1 Freedom and totalitarianism

Early science fiction literature combined the rational calculus of the natural sciences with utopian yearnings for emancipation and transformative social experimentation – much like contemporary NewSpace. Modern space engineering owes much to scientists from the Russian cosmist tradition, predominantly Konstantin Tsiolkovsky (1857-1935), in addition to American rocket pioneer Robert Goddard (1882-1945) and German physicist-engineer Hermann Oberth (1894-1989). Tsiolkovsky, Goddard and Oberth had all consumed the work of Jules Verne, in particular his *De la terre à la lune (From the Earth to the Moon 1865)*, which had offered some accurate calculations for potential escape velocities from Earth – albeit using a cannon to fire

astronauts to the Moon (McCurdy 2011, p.16).

Science and technology historian Patrick McCray has coined the term ‘visioneer’ (2013), a portmanteau of visionary and engineer that captures the pragmatic and idealistic impulses exhibited by Tsiolkovsky and Goddard (and later ‘old’ and ‘new’ space figureheads like Werner von Braun and Gerard O’Neill, respectively). Technical design of rockets and spacecraft (which, for Tsiolkovsky, pre-dated their actualisation by several decades) merged with speculations on spaceflight’s potential for transforming and emancipating society. For Tsiolkovsky, an autodidact active in 1920s Soviet Russia, the promise of outer space was its material abundance and unoccupied space, a cornucopia that could liberate humanity:

“...how vast and free is the space that surrounds Earth; you know that it is filled with light; you know that it is empty...Who is there to stop Men from building their greenhouses and their palaces here and living in peace and plenty?...This will give us the possibility of operating various kinds of solar engines, welding metals and performing a great many manufacturing operations without the use of fuel” (cited in Michaud 1986, pp.63-64)

Tsiolkovsky envisioned off-world ‘greenhouses and palaces’ – in other words, life-sustaining agriculture and centres of governance. This ‘off-worlding’ schema was central to the 1970s visioning of Gerard O’Neill and the genesis of NewSpace.¹²

While Tsiolkovsky’s utopia was generally devoid of political polemic, historian Gerard DeGroot has noted that he equated “weightlessness and liberty”, on the space frontier “one could find freedom and fulfilment” (2006, p.5). Tsiolkovsky yearned to be “freer than a bird in flight...[and] unfettered by gravitation”, and outer space heralded the “perfection of mankind and its individual members” (cited in DeGroot 2006, pp.4-5). Tsiolkovsky espoused a “Promethean urge to remake everything that surrounds us” and “brought a messianic and transformative vision to the cause of spaceflight” (Siddiqi 2008, p.266, p.267). After his death in 1935, the Soviet Union would declare him “the father of cosmonautics” (McDougall 1997, p.19).

To my knowledge, Ludwig von Mises, Friedrich Hayek and other economists central to the development of neoliberal thought and policy were entirely disinterested in the question of

¹² As a further NewSpace precursor, Irish communist, scientist and historian of science and technology JD Bernal had also proposed in 1929 that “the asteroids would be convenient sources of solid raw materials. . . . Feeding on sunlight, asteroids, and planetary gases, the space habitations could grow to any desirable size” (cited in Michaud 1986, p.64).

outer space. They were nonetheless Tsiolkovsky's contemporaries, with the seeds of neoliberalism being planted in Europe in the 1920s against a backdrop of emerging socialist government. NewSpace rhetoric has described private property as an essential human freedom (e.g. NSS 2019) and has excoriated centrally-coordinated space activity as unfree (e.g. Tea Party in Space 2014). This sentiment echoes principles that emerged in neoliberal thought during this period (Lippman 1938; Hayek 1986).

Vienna was the nucleus of early neoliberalism, which responded to socialist gains across Europe in the wake of WW1. The Social Democratic party had gained a majority in the 1919 Viennese municipal elections, while the Republic of German-Austria had introduced nationwide unemployment benefits and an eight-hour working day. Combined with Communist revolutions in Russia and neighbouring Hungary, and Germany's social democratic Weimar Republic, it was apparent to those in the intellectual scene of 'Red Vienna' that liberalism was no longer an unquestionable economic or political orthodoxy. Ascendant trade unionism highlighted that the collective was evidently as important as liberalism's ubiquitous individual, and this individual was neither inherently self-interested nor would the 'invisible hand' inevitably deliver socially desirable outcomes (as Adam Smith himself had noted). For Mises and Hayek, among others, the challenge was to restore the credibility of a liberal, *laissez-faire* form of economics in the face of its obvious failure to deliver material well-being and social security for all individuals in society (Plehwe 2009, p.10).

Neoliberalism and space exploration were spurred (in different ways) by the rise of totalitarianism in Europe. Staying with the former, political economist Dieter Plehwe describes how the 'neo' got into neoliberalism (2009). He notes that the Viennese period was yet to produce a critique of classical liberalism, and still retained a largely negative understanding of the role the state could play in the functioning of markets (Plehwe 2009, p.11). Plehwe outlines how neoliberal ideas as we would now recognise them began to crystallise in the wake of the 1937 publication of American political commentator Walter Lippman's (*An Inquiry into the Principles of) The Good Society* (1938). Lippman mounted an impassioned rejection of what he called "the cult of the state as provider and savior" (Lippman 1938, p.37-38). He railed against both the totalitarianism ascendant in Europe in the mid-1930s, and against planned economies and bureaucracies more generally. Lippman homogenised fascism, communism, Keynesianism and the social liberalism of the Roosevelt Administration's (1933-1945) New Deal, and critiqued

these diverse political forms as ‘collectivism’ and ‘directed societies’. He believed “there is nothing in the collectivist principle which marks any stopping place short of the totalitarian state” (ibid, p.52). This ‘slippery slope’ argument was later echoed by Hayek (1986).

Lippman articulated a core ideological tenet of neoliberalism that would later be central to the philosophy of Hayek and the Mont Pèlerin Society: the defining of “totalitarianism primarily with regard to the absence of private property, rather than with the more commonplace reference to a lack of democracy or countervailing political power” (Plehwe 2009, p.13). Contemporary NewSpace also aggregates alternatives to economic liberalism – particularly when they are articulated in international laws seeking to constrain market freedoms in the service of a common, social good – and paints them as restrictive, unjust collectivism (e.g. NSS 2009, p.6; Gump 2018). In the words of the National Space Society:

“private property is one of the principal freedoms guaranteed by our nation’s Constitution. Without this protection, individuals also would lose the safety of their persons and political rights” (NSS 2009, p.3).

Liberal democratic constitutions protect a range of civil and human rights. However, NewSpace and neoliberalism disproportionately emphasise the safeguarding of rights to private property – as if private property were important to ‘the safety of their persons’ in the hostile environs of the off-world...

The Great Depression was an unparalleled socioeconomic catastrophe brought about by unfettered free-market capitalism and its ‘animal spirits’ (Keynes 1936). Arriving in its immediate wake, Lippmann’s critique of state intervention in the market rested upon “a principle (to say the least) leaning against the wind” (Plehwe 2009, p.13). While much of the world was leaning into Keynesian macroeconomic management and welfare state protections, Lippman argued instead for a minimal state, confined to the basic provision of law and order such that voluntary, contractual exchange could be maintained:

“In a free society the state does not administer the affairs of men. It administers justice among men who conduct their own affairs” (cited in Plehwe 2009, p.13).

Karl Polanyi, also of the Red Vienna intellectual scene (who I discuss in the following chapter), noted that participation in the market was effectively involuntary for those multitudes “torn from [their] roots and all meaningful environment” by industrial capitalism (Polanyi 2001 [1944],

p.87). This is a fact given less emphasis in neoliberalism's utopian 'free society'. Regardless, Lippman's attempt at revitalising a philosophy of government and law predicated on the preservation of individual economic liberties resonated with liberal economists on both sides of the Atlantic.

In 1938, a year after the publication of *The Good Society*, the Colloque Walter Lippman was held in Paris. It is here where the term 'neoliberalism' was coined: a 'new liberalism' that was apparently more popular a term than other suggestions like *néo-capitalisme* or *libéralisme positif* (Plehwe 2009, p.13).¹³ In Paris, some of the more recognisable tenets of neoliberalism emerged, chiefly the acceptance of the need for a strong and impartial state that respected and safeguarded free enterprise, competition between firms and the operation of the price mechanism – the latter considered the prime coordinator of economic relationships (Plehwe 2009, p.14). There is a clear aporia already evident in this embryonic stage of neoliberalism, as Mitchell Dean describes: an authoritarian streak where “a strong state was needed [paradoxically] to promote economic freedom and markets, and to neutralize the pathologies” of parliamentary democracy and the welfare-state demands made within it (2014, p.155). The neoliberal 'double truth' (Dean 2014; Mirowski 2013) is best encapsulated by German political economist and Colloque participant, Alexander Rüstow, who had summarised the new liberalism as 'Free Economy – Strong State' (cited in Dean 2014, p.154).

Two strong states had indeed emerged on the continent by the time of the Colloque Walter Lippman – Nazi Germany and the Soviet Union. The outbreak of World War Two postponed the development of an organised and politically-active neoliberalism and, returning to our other narrative, the two most powerful totalitarian states in human history gave rise to modern rocketry and the first actualisations of the spaceflight vision. Rather than preserving free enterprise, competition or individual liberties, the National Socialist and Communist dictatorships had increasingly large military-industrial complexes coordinated under varying degrees of command economy.¹⁴ The Allied powers would also rely on central planning as the backbone of their war economies, including the coordination of privately-owned arms

¹³ Many of the participants had discussed a 'new liberalism' in Vienna a decade prior – American economists Lionel Robbins and Frank Knight had attended a seminar hosted by von Mises at the Austrian Chamber of Commerce, for instance, and would go on to work in the Chicago School of economics (Plehwe 2009, p.11).

¹⁴ Nazi Germany had not collectivized private industry in the same manner as the Soviet Union, but had nonetheless coordinated firms like Volkswagen and IBM in the service of the wartime economy.

manufacturers in the US and the nationalisation of arms and ordinance manufacturers in the UK. However, the American development of rocketry did not begin until after WW2. Core developments in the technologies of spaceflight can instead be attributed to the antitheses of NewSpace and neoliberalism's free societies.

The Soviet Union would become the US' key rival during the main thrust of space research and engineering during what Lippman, writing for *Foreign Affairs*, had dubbed 'the Cold War'. Walter McDougall's (1997) extensive archival research is particularly valuable for approaching this early political history of the 'space race'. The first Russian rocket scientists had formed the All-Union Society for the Study of Interplanetary Communication (OIMS) in 1924, and developed research, outreach and publication practices that were initially independent of the Soviet state (McDougall 1997, p.27). The OIMS began hosting conferences with the regime's Central Bureau for the Study of the Problems of Rockets soon after, shifting rocket science "from theory to praxis" and into Soviet wartime technoscience (ibid, p.27). From 1930 onwards, engineers like Sergei Korolev, Tsiolkovsky's student Fridrikh Tsander and Valentin Gushko sculpted rocket designs into warhead bearing missiles (McDougall 1997, pp.36-37). Following Stalinist purges, Korolev joined Russian aviation pioneers in the *sharaga* labour camps that imprisoned those with technical expertise, "[resuming] their mental work on behalf of their own masters, despite a miserable climate, meagre rations, and the presence of armed guards" (ibid, p.38). What began as a Tsiolkovian dream of emancipatory spaceflight became subsumed within an R & D base forged by Stalinization (ibid, p.39).

Soviet wartime rocketry was limited to shorter-range missiles. It was through Nazi Germany's coercion of intellectual and physical labour that the first notable rocket program was realised (albeit reaching only the lower boundaries of what could be considered 'outer' space). In inter-war Germany, there was a brief period of amateur rocket science in the form of rocket club Verein für Raumschiffahrt (Society for Space Travel; formed in 1927), which included Werner von Braun, Willy Ley and Hermann Oberth (all of whom became key personnel in the Apollo Program). Much like Tsiolkovsky, von Braun and co were fascinated with the utopian potential of spaceflight and produced some rudimentary, unmanned rockets that launched into the upper atmosphere (Kilgore 2003). In late-Weimar Germany, rocket technology and its progenitors were also co-opted into the machinery and bureaucracy of war. Shortly before the Nazi Party took power, the *Reichswehr* army sent members of its ordinance division to visit the VfR 'rocketport'

in Berlin and recruited key personnel in Ley and von Braun (MacDougall 1997, p.43; Kilgore 2003, p.70).¹⁵ As in Russia, “the rocketeers did not find state support – the state found them” (McDougall 1997, p.43).

Kilgore describes how early ‘astrofuturist’ figures like Ley and von Braun would be transformed by the Third Reich from “a group of idealistic backyard experimenters into the technical managers of a large-scale enterprise that could use slave labour as an efficient means of production” (Kilgore 2003, p.55). Between 1944-45, the V-2 rocket production lines of Peenemünde were reliant on slave labour from neighbouring concentration camps (MacDougall 1997, p.44; Kilgore 2003, p.54-55). In McDougall’s words: “If too weak to work, slaves were left to expire – 150 per day – human sacrifices on the altar of machines and power” (1997, p.44). In mid-1944, V-2 rockets began to breach the upper atmosphere on their trajectories towards London, Antwerp and a host of other British and European cities. The first rocket-powered flights off-world were conducted in the service of genocidal totalitarianism.

Friedrich Hayek was lecturing at the London School of Economics during this apocalyptic onslaught of Nazi technoscience. It was during the war when he had written one of neoliberalism’s foundational texts, the *Road to Serfdom* (1986 [1944]). He had commenced his work by saying that the US and UK were in danger of repeating the fate of Germany – “though the road be long, it is one on which it becomes more difficult to turn back as one advances” (Hayek 1986, p.2). Yet his concern was as much with those social democracies of Weimar Germany or Sweden “held up by progressives as an example to be imitated” as it was with National Socialism (ibid, p.2). Like Lippman, Hayek’s political economy took aim at collectivism and centralised planning. He was concerned that in Western democracies there was “the same determination that organization of the nation we have achieved for purposes of defense shall be retained for the purposes of creation” (ibid, p.2). Along with the centrally coordinated war economies, Hayek asserted that planning of any kind was problematic, for it was predicated on “ideals whose realization would lead straight to abhorred tyranny” (ibid, p.3).

¹⁵ Following the hitherto unparalleled destruction of the First World War, provisions within the Versailles Treaty had limited the development of long-range artillery in Weimar Germany – rocket-propelled explosives presented an appealing work-around for military officials looking to strengthen the German armed forces (Kilgore 2003, p.70).

Rather than vesting control in a centralised authority, Hayek believed that only through the distributed decision-making of property-owning individuals could freedom prevail.

“What our generation has forgotten is that the system of private property is the most important guarantee of freedom, not only for those who own property, but scarcely less for those who do not... If all the means of production were vested in a single hand, whether it be nominally that of ‘society’ as a whole or that of a dictator, whoever exercises this control has complete power over us.” (ibid, p.78)

The Road to Serfdom provided an early conceptualisation of Hayek’s notion of ‘spontaneous order’ – the ideological commitment that “in the ordering of our affairs we should make as much use as possible of the spontaneous forces of society, and resort as little as possible to coercion” (Hayek 1986, p.13)¹⁶.

Yet, for a project motivated by the spectre of totalitarianism and dictatorship, *The Road to Serfdom* contained the early seeds of an authoritarian liberalism that would pervade Hayek’s later work (Cristi 1984). Consistent with the ‘Strong State – Free Economy’ disavowal of *laissez-faire* held by the Colloque participants, Hayek believed in “deliberately creating a system within which competition will work as beneficially as possible” – a legal order benefitting market capitalism that was scarcely ‘spontaneous’ (Hayek 1986, p.13). In *The Road*, Hayek hinted that this system should entail “democracy with definitely limited powers” (Hayek 1986, p.173). His desire for constitutional limits on democratic power contradicts any concern he may have had about tyranny, and this contradictory position would become realised through the explicit alliances that neoliberal theorists would later forge with dictatorial regimes in the pursuit of trade liberalisation (Mirowski 2009; Fischer 2009).

NewSpace’s publicly-advertised mission to democratise outer space often belies a Hayekian distrust of democracy, or a desire to render the space economy immune from politics. The National Space Society, for instance, has decried how governments “have inherent pressure to think in the short-term and perhaps just to the next election” (2012, p.6). At face value, this statement reflects NewSpace frustration at the absence of a compelling, long-term vision for American space policy – the NSS also note that industry is equally capable of such short-

¹⁶ Hayek refined this into a model of the market as an autonomous, self-regulating and indeed omniscient processor of information (in the form of price signals) – a decentralised authority that was vastly superior to the informationally-deficient centralised decision-making of the state (Hayek 1950).

termism (NSS 2012, p.6). NewSpace’s commercial orientation derives in part from the realisation that the priorities of the *demos* (and thus the national budget) lay closer to home than the off-world frontier, but is there more to ‘NewSpace democracy’ than disquiet about the tyranny of the majority? Consider this provocative edict from Moon Express CEO, Bob Richards:

“the U.S. government should in principle enact laws that assure freedom of enterprise in space, making it illegal for the government to deny or restrict private sector space activity” (Richards 2017, p.4).

Richards makes this statement while arguing for streamlined regulatory processes concerning launch approval and goes on to say that these laws should “not breach U.S. obligations under international treaties” (ibid, p.4). However, beneath his concern about bureaucratic inefficiency is an assertion that the space economy should be rendered immune from democratic accountability (made during invited Congressional testimony, no less). One gets the impression that extra-terrestrial liberty requires extra-parliamentary freedoms – to be well and truly above any laws that could constrain space enterprise. Later in the dissertation, we will return to issues of democracy as they appear in NewSpace lobbying and in international law (sections 3.3 and 4.2.2).

1.1.2 The National Aeronautics and Space Administration, and the Mont Pèlerin Society

We will now turn to two landmark moments in the history of space exploration and neoliberalism. First, the establishment of the National Aeronautics and Space Administration (NASA) in 1958 and the beginning of the space age proper. Second, the establishment of a transnational neoliberal network through the Mont Pèlerin Society (MPS) in 1947, which is the taproot of the modern-day Atlas Network that has shaped US space resources policy. The neoliberal creed of the MPS highlights the disjuncture between NewSpace’s rejection of centrally planned economies and the Keynesian foundations of the American space program. At this point in our entwined narrative, however, neoliberalism and NewSpace remain disparate projects and I will subsequently focus on space exploration in this section.

As far as the United States is concerned, post-war neoliberal thought was largely confined to the work of the Chicago school of economics and would not penetrate economic policy and public discourse until the 1980s (through the Reagan Administration). In 1947, the Volker Fund – managed by the “strident anti-New Deal conservative” Harold Luhnow – had provided funding for Hayek’s temporary position at the University of Chicago (Van Horn & Mirowski 2009, p.141). With the Foundation for Economic Education, the Volker Fund also assisted the establishment of the MPS, which took its name from the Swiss resort overlooking Lake Geneva where it was first held (ibid, p.140). Van Horn and Mirowski’s archival research into the establishment of both organisations reveals that Hayek and Milton Friedman were keenly aware that – contrary to the detached “inveterate optimists” or “curmudgeonly elitists” of classical liberal thought – a neoliberal economic order would need to be consciously constructed (ibid, p.160).

Core tenets of neoliberalism were established through the MPS and the early years of the Chicago school. The MPS Statement of Aims was deliberated upon during the 1947 meeting and now adorns their website (MPS no date). If some mention of ‘opening the space frontier’ were added, the Statement would be at home in NewSpace advocacy.

“The central values of civilization are in danger. Over large stretches of the Earth’s surface the essential conditions of human dignity and freedom have already disappeared. In others they are under constant menace from the development of current tendencies of policy. The position of the individual and the voluntary group are progressively undermined by extensions of arbitrary power.

The [MPS] holds that these developments have been fostered by ... a decline of belief in private property and the competitive market; for without the diffused power and initiative associated with these institutions it is difficult to imagine a society in which freedom may be effectively preserved” (MPS n.d.).

The orientation of neoliberalism towards the state is evident in the MPS’ founding principles, confining its role to the preservation of market freedoms. The neoliberal policy program emerged from MPS work that centred on the “redefinition of the functions of the state”, “establishing minimum standards by means not inimical to initiative and functioning of the market” and creating and safeguarding an international order of peace, liberty and “harmonious international

economic relations” (MPS n.d.). By the present-day, these conditions have been met in the American space program – though, as will be discussed, the CSLCA challenges the ‘harmoniousness’ of international space law.

I have not discovered a great deal of interest from MPS theorists on America’s costly involvement in the space race. Yet the founding of the American space program was predicated on a highly co-ordinated means of production, and a much broader scope for government decision-making than the ‘diffused’ market forces to which the MPS aspired. In the wake of the Axis Powers’ defeat, the United States commenced its Cold War rivalry with the Soviet Union – a highly militarised clash between communism and capitalism. It did so through a huge injection of public funds in what was essentially a massive public works project facilitated by centralised planning and bureaucracy. In 1958, the Eisenhower Administration (1953-1961) passed the *National Aeronautics and Space Act*, which established a federal “civilian agency exercising control over aeronautical and space activities” (NASA Act 1958, s.102). This would, of course, be NASA: an agency independent of presidential control but part of the executive branch. The *NASA Act* declared that:

“...it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind... The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities (1958, s. 102).

Its first major program was Project Mercury (1958-1963), which sent astronaut John Glenn into Earth orbit in 1962. As an expression of both ‘all mankind’ cosmopolitanism and directed towards the ‘general welfare’ of American society, NASA arrived during an era of Keynesian demand stimulus and social security measures established under Roosevelt and continued under the Republican Eisenhower Administration. NASA was part of “the largest peacetime public works program in history” that also included the Federal Highway System (Linklater 2015, p.359). Nowhere is commerce or economy mentioned in the *Act*, such revisions would not take place until the neoliberal reforms of the Reagan Administration.

Science and technology historian Joan Lisa Bromberg has emphasised that, from the very inauguration of American space policy, there have always been public-private partnerships – partnership, in a broader sense, implying “contention as well as concord” (1999, p.14). In spite of NewSpace claims to the uniqueness of their project and the government barriers standing in their

way, NASA supported private enterprise from the outset. Bromberg notes that “[leaders] of the aerospace industry...were among the Wise Men who in 1958 gave counsel on NASA’s conception and birth” (1999, p.1). Eisenhower appointed T. Keith Glennan to be NASA’s first Administrator (a position roughly analogous to a ministerial appointment). Glennan shared Eisenhower’s “philosophy of small government and of giving the maximum possible scope to the private sector” (ibid, p.17). Space historian Howard McCurdy similarly emphasises how, under Glennan’s leadership, “NASA would rely upon private contractors instead of government-owned plants to produce rockets and spacecraft” (McCurdy 2011, p.270).

Glennan’s ‘limited government’ approach to managing NASA programs resulted in a marketplace that was entirely dependent on the government as a sole purchaser of the technologies necessary for spaceflight. This required a swelling bureaucracy to co-ordinate the development of these technologies. NASA is much more than Cape Canaveral: in addition to the Kennedy Space Center in Florida, there are now research centres in Virginia, Ohio and California (the Jet Propulsion Laboratory and Ames Research Center), and space flight centres in Alabama, Texas and Maryland. All these departments are coordinated by NASA Headquarters in Washington, D.C. Between 1960 to 1963, NASA’s total personnel expanded from 10,000 to 30,00 people (Bromberg 1999, p.62). NASA’s workforce reached a peak of 35,680 in 1967 (NASA 1997, p.28). The number of people indirectly employed through NASA, via contracted aerospace firms across ‘gunbelt’ states of the south and southwest like Florida, Alabama, Texas, Colorado and California (Markusen et al. 1991), was many thousands more. In his ethnography of contemporary NewSpace, David Valentine cites interviewees who deride NASA as “a wasteful government ‘jobs program’” (2012, p.1047). Yet Valentine also notes that NASA is continued to be viewed as a crucial employer across the US and across bipartisan political divides (2012, p.1066, FN 3).

NewSpace often mythologises the unbridled creativity and innovation of the tech entrepreneur, in contrast with the cumbersome state (e.g. Hudgins 2011). The SFF’s inspiration for the ‘NewSpace’ moniker likely derives from the Michael Lewis’ 2000 book, *The New, New Thing* (SFF, in Denis et al. 2020, p.432). The book lauded the entrepreneurial, ‘visionary’ culture of Silicon Valley at the onset of the 1990s Internet boom (an important quarter for investment in contemporary space mining ventures). Yet this hotbed of American industry owes a great deal to military contracting in the Cold War period. Historian Thomas Heinrich describes how Santa

Clara County, California, produced the majority of transistors, integrated circuits and microprocessors central to early military projects in missiles and satellites (2002, pp.247-248). A significant event for Silicon Valley was the 1956 relocation of Lockheed Corporation's missile division to the Valley's Moffett Federal Airfield, next door to the NASA Ames Research Center.¹⁷ The renamed Lockheed Missile and Space Corporation eventually became "the largest industrial employer in Silicon Valley during the Cold War" (ibid, p.258). In Heinrich's words,

"No account of postwar batch production industries is complete without a close look at the Strangelovian netherworld of defense policy, military procurement, Pentagon-funded research and development, and weapons production" (ibid, p.280).

Today, hangars in the publicly-owned Moffett Airfield house the private jets of Google's billionaire executives (Lardinois 2014), forming an apt symbol for techno-libertarians' tendency towards an "inflated sense of their own resourcefulness in developing new ideas...[and giving] little recognition to the contributions made by the state, their own labour force, or the wider community" (Barbrook & Cameron 1996, p.55). Mazzucatto's (2013) *The Entrepreneurial State* thoroughly debunks the myth of the risk-averse public institution and the innovating entrepreneur. Many key ICT technologies were supported and developed through state patronage, representing the "socialisation of risk and the privatisation of rewards" (Mazzucatto 2013, ch.9).

NASA's co-ordination and management of numerous firms contracted to design and construct rocket stages and spacecraft components represented a highly-centralised form of decision-making that is at odds with contemporary NewSpace's emphasis on commercial independence from government directives.¹⁸ The landmark achievements of American spacefaring originate with the heavy and very visible hand of the US state, rather than anything

¹⁷ Moffett was home to the corporate headquarters of space mining firm Deep Space Industries. NASA Ames also includes a number of public-private partnerships, including Singularity University (an incubator founded by Planetary Resources chairman and founder Peter Diamandis).

¹⁸ Several neoliberal thinkers like Hayek and Michael Polanyi had founded the Society for the Freedom of Science during WW2, "for the purpose of protecting science from corruption through government planning" (Mirowski 2002, p.183). The younger Polanyi, an MPS member, would later frame the production of scientific knowledge in Hayekian terms, believing "a central authority cannot improve on the spontaneous emergence of growing points in science" (2002 [1969], p.477). This claim is ignorant of avowedly unspontaneous scientific knowledge that was produced through the multibillion-dollar state patronage of 'big science' projects, like those in Peenemünde and Huntsville (and Los Alamos and numerous other examples).

resembling the “new lean, mean set of alternative space firms” NewSpace actors have lauded more recently (Tumlinson 2003, p.12).

1.1.3 The climax of ‘old space’

The ‘old space’ era began in earnest with the orbit of the Soviet *Sputnik* satellite in 1957 and reached its climax with the fabled lunar landing of Apollo 11 in 1969. In the decades since Apollo 11, many significant milestones have been realised in space science, engineering and commerce – from the massive expansion of the commercial satellite industry since the late 1970s, through to the recent imaging of Pluto conducted by NASA’s *New Horizons* spacecraft. In NewSpace discourse, however, ‘old space’ represents a ‘golden age’ of spacefaring that NASA, the US Government and military-industrial contractors are incapable of repeating (Diamandis, in Hoffman, 2010; Vance, cited in Shamas & Holen 2019, p.6). There would appear to be a contradiction here between NewSpace opposition towards the Keynesian macroeconomic management that guided NASA funding in this period, and the goal of realising ‘free’ space economies.

Now realised, the spectacle of spaceflight was a coronation of human ingenuity and mastery of the physical sciences. It was also an off-world projection of volatile Cold War hostilities and the expanding military-industrial might of the superpower rivals. Kennedy’s challenge to send an American to the Moon by the end of the 1960s was part of a broader “‘freedom doctrine’ aimed at confronting communism on the world stage”, a strategy of containment that was equally concerned with modernising the American military, providing foreign military and economic aid, and negotiating a comprehensive nuclear test ban (Mazo 2009, p.226). The Kennedy Administration settled for ratification of the *Partial Test Ban Treaty* (1963), an early UN treaty of the global commons that prohibited nuclear testing in the atmosphere, outer space and under water.

President Kennedy’s famous 1962 speech at Rice University oscillated between patriotic exceptionalism and cosmopolitan invocations of ‘humanity’: “the eyes of the world now look into space, to the Moon and to the planets beyond, and we have vowed that we shall not see it governed by a hostile flag of conquest, but by a banner of freedom and peace”, and yet “the vows of this Nation can only be fulfilled if we in this Nation are first... the world’s leading space-

faring nation” (1962). Jazeel notes that the Soviet Union also “deployed the rhetoric of universal freedom and common human rights” in service of international competitiveness (2011, p.82). Upon taking power in 1964, and shortly before expanding the military budget of the USSR, General Secretary Brezhnev declared:

“We Soviet people do not look upon our space exploration as an end in itself, as some sort of ‘race’. The spirit of gamblers is profoundly alien to us in the great and serious business of exploring and conquering outer space. We regard this enterprise as a component of the tremendous, creative work in which the Soviet people is engaged, consistent with the general line of our party in all areas of the economy, science and culture, in the name of man and for the good of man” (cited in MacDougall 1997, p.296).

There may well have been a transcendent, unifying moment when millions fixed their gaze on the black and white images of Armstrong and Aldrin surveying the ‘magnificent desolation’ of the Moon’s surface. However, as Jazeel has described it, space was a key domain in which “competing political universalisms were contested” (Jazeel 2011, p.82). Superpower claims to international leadership were mobilised through contrasting discourses of freedom and collectivism, the techno-industrial spectacle of spacefaring serving as proof of each side’s virtue and might. Both the US and USSR often developed ‘dual use’ technologies that could serve both civilian and military purposes. For the US, intercontinental ballistic missile (ICBM) designs developed by von Braun and his Huntsville team informed the Saturn rocket program that launched Apollo astronauts on their way to the Moon. With a bit of tinkering, those rockets carrying the hopes and dreams of their respective peoples could also carry nuclear warheads to Moscow or Washington.

The ensuing Johnson Administration (1963-1969) pursued what can be described as a Keynesian approach to managing and directing the space program. James Webb, the second NASA Administrator who would serve under Kennedy, Johnson and Nixon, directed the Agency’s spending as a means of building national R & D capacity and as “an engine for domestic [economic] growth” (Bromberg 1999, p.61). Bromberg (1999) describes NASA’s contracts with firms North American Aviation and Hughes Aircraft for the design and construction of the Apollo rocket boosters and spacecraft. She illustrates how Webb’s administration of NASA involved the direct management of contracting firms (often through

project management and personnel secondments) rather than trusting in their autonomy and ‘forces’ of competition.

“Webb saw the private sector, properly used, as a way to provide the government with resources in a flexible manner, as well as an engine for achieving efficiency, rapid results, and low costs...On the other hand, Webb believed that national space policy should not be turned over to private firms. It was government acting in the public interest that had to determine what should be done, when it should be done, and for how much money” (ibid, p.61).

Webb saw the potential for distributed NASA procurements to “spread money to less developed parts of the nation, and serve as a template for other large scale social programs” (Bromberg 1999, p.61). Under Webb, the public-private partnership would slant in favour of the public interest.

In addition to economic growth, American exceptionalism and security was also perceived to be at stake. The Apollo Program has been described as “first and foremost a soft-power effort par excellence, to put down a marker for American prestige” (Mazo 2009, p.226). While there were differences in NASA procurement frameworks under Republican and Democratic leadership, there was a bipartisan perception that a technologically superior Soviet Union posed a threat to the US. The injection of public funding during the ‘old space’ period owes much to the fact that, prior to Neil Armstrong’s ‘giant leap for mankind’ in 1969, their Cold War antagonists had taken a clear lead in the race to space. A succession of triumphs presented a propaganda coup for the Soviet Union: *Sputnik 1* (1957) became the first artificial satellite orbiting Earth; the first Earthly being in space was the dog Laika (1960); Yuri Gagarin (1961) and Valentine Tereshkova (1963) became the first man and woman in outer space, respectively; and the Luna Program achieved the first landings of man-made objects on the Moon’s surface (an impact from *Luna 2* in 1959 and a soft landing from *Luna 9* in 1966). American technological supremacy and its grasp on the ultimate military high ground could no longer be presumed. Subsequently, the Apollo Program ran from 1961-1972 at a total cost of US \$25.4 billion (U.S. House of Representatives 1974, p.1271). NASA funding was at its highest proportion in 1966: 4.4% of the national budget, more than twice the proportion allocated to the Department of Education in that same year (OMB 2019).

The ‘golden age’ of space travel was set against a backdrop of global anti-communist, anti-capitalist and anti-colonial movements, with the Cold War frequently playing out in proxy

conflicts in the global south. The *Outer Space Treaty* (1967) appears inconsonant with the tumultuous international environment in which it was ratified: a cosmopolitan gesture in international law that characterised outer space as a commons, arriving during a sustained period of geopolitical tension and the omnipresent threat of Mutually Assured Destruction.¹⁹ Conflicts flared in Europe, Asia, the Middle-East and the Caribbean throughout the 1960s: ranging from the US war with Communist Indochina and anti-colonial movements like those against Israeli expansionism or English occupation of Northern Ireland. However, the *Treaty* asserted that peace would reign in outer space: a host of UN member states “often in conflict with one another and adhering to widely divergent political philosophies” ratified the *Treaty* in the hope that it would ward against off-world militarism and conquest (Dembling & Arons 1967, p.420). It can be read as a repudiation of colonial empire (Marboe & Johnson, in IISL 2016, p.26). The *Treaty* declared that the “exploration and use of outer space...shall be carried out for the benefit and in the interests of all countries...and shall be the province of all mankind” (OST 1967, Art. 1) and that the space commons were “not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means” (Art. 2).

The 1969 Apollo Moon landing involved only a symbolic planting of the US flag, and any questions of resource ownership were drowned out by international marvel at NASA’s technological feat and the bravery of the Apollo astronauts. When the Apollo mission returned samples of lunar rock, they were treated as scientific objects that would be ultimately shared amongst nations – no ownership claim was made over them, and many samples were distributed to the international community (a gift economy that contrasts with the private property model of the CSLCA). However, it did raise the question of exploiting off-world resources: from silicon and aluminium to iron and titanium, some people considered Apollo to “have been of enormous value for its lunar prospecting function” (O’Neill 1977, p.57).

The ‘old space’ era underlines the scale of investment and central coordination that were required to achieve the ambitious goal of crewed spaceflight to other celestial bodies. The history of spaceflight’s most successful period suggests that a clear separation of space activity into ‘public’ or ‘private’ spheres is unlikely to be achieved, at least with costly projects that attempt to send humans beyond low-Earth orbit. The entanglement of spaceflight in politics was not always agreeable to those interested in the off-world frontier. To use von Braun’s words: “We

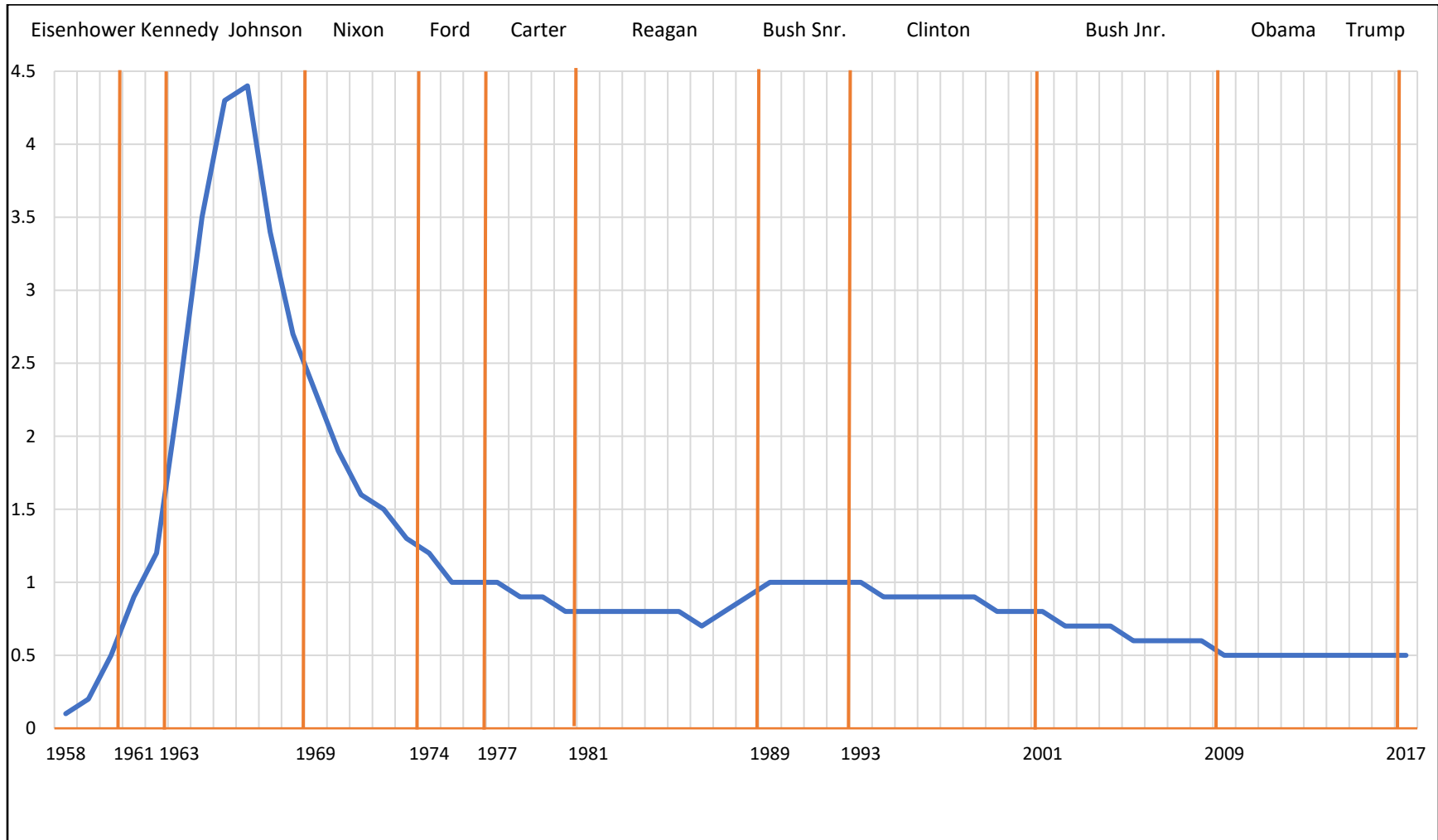
¹⁹ I reserve detailed discussion of the OST and its Cold War origins for Chapter 4.

can lick gravity, but sometimes the paperwork is overwhelming” (cited in Finney & Jones 1985, p.13).

1.2 1970s: liberty, limits and the dawn of NewSpace

During the 1970s, the optimism of the ‘space race’ period was undermined severely by a rapidly changing political-economic environment. NASA funding receded well below its Apollo peak, the US was humiliated in Vietnam, and the American environmentalist movement became cognisant of the ‘limits’ to economic growth (Meadows et al. 1972). The oil shortages of the 1970s fuelled stagflation and a recognition of resource finitude. In this decade, NewSpace political-economic and political-ecological philosophies crystallise through the work of Princeton physicist Gerard K. O’Neill, who responded to these social and environmental crises. In doing so, he articulated ideas that are now central to the NewSpace imaginary: space colonisation, off-world manufacturing and the mining of lunar and asteroidal resources (O’Neill 1974; 1977). His career trajectory involved a collision with the realities of space funding and policy, and his legacy – in the organisations he inspired and his resort to pursuing space settlement through commercial means – is influential in giving NewSpace its ideological affinities with neoliberalism. The L-5 Society, a civil society group inspired by O’Neill, launched a successful campaign against the UN *Moon Agreement* (1979), which attempted to codify the common property principles of the *Outer Space Treaty*. L-5’s campaign fused O’Neillian techno-utopianism with neoliberal opposition to international government, and their success in defeating the *Moon Agreement* opened the door for the US’ recent unilateral assertion of off-world private property law.

Figure 3: Annual NASA funding as percentage of total national budget^{20 21}



²⁰ 1958-1961 data from Steinberg (2011, p.243).

²¹ 1962-2019 data from OMB (2019).

1.2.1 O'Neill's High Frontier and the limits to growth

In the same year that Apollo 11 landed on the Moon, Gerard O'Neill – a tenured physics professor at Princeton University – was preparing to teach the undergraduate 'Physics 103' course for the 1969-70 semester. "Relatively stiff [and] requiring calculus", the course was a bit dry, given the zeitgeist (O'Neill 1977, p.233). The civil rights and feminist movements had won hard-fought legal victories, the unpopular Vietnam War continued and university campuses – Princeton among them – were significant sites for the mobilisation of dissent. Student protests opposed the militarisation of scientific research, as several universities undertook classified research into fundamental physics and chemical weapons on Department of Defense contracts. Armstrong's footsteps on the Moon may have briefly unified the US electorate in admiration of NASA, but the Apollo Program was frequently derided at the time as a massive misuse of national funds and misplaced political energy (O'Neill 1977, p.234; Deudney 1982, p.11). In this climate of anti-military protest and technological pessimism, Physics 103 would need to "attack the question of the place of the scientist and the engineer in the society of the next decades" (O'Neill 1977, p.235).

The first question O'Neill asked his students was, "Is a planetary surface the right place for an expanding technological civilization?" (O'Neill 1977, p.236). It was of course a loaded question, in the assumption that civilisation can and will inevitably continue expanding (an assumption that prevails in both NewSpace advocacy and neoliberal growth policy). However, in keeping with O'Neill's commitment to restoring the social value of technoscience, the question reflected those raised by the American environmentalist movement that had gained much momentum in the years prior, of which I present only a brief account here. From 1965, economist Kenneth Boulding argued that Earth "has become a single spaceship, without unlimited reservoirs of anything, either for extraction or pollution" (1966, p.7). The term 'spaceship Earth' was subsequently popularised by British economist Barbara Ward, US Ambassador to the UN Adlai Stevenson II and futurist Buckminster Fuller, among others (McCray 2013, p.23). Garrett Hardin's (1968) paper 'The Tragedy of the Commons' described the tendency towards over-exploitation of common spaces and resources. Paul Ehrlich's (1971) *The Population Bomb* described the dangers of unchecked population growth and the unequal access to food between developed and developing nations. Grassroots environmental activism

also emerged: activists in San Francisco held the first ‘Earth Day’ in 1970, following the 1969 spill from Union Oil’s Santa Barbara platform. Public demand for environmental protection was recognised in national legislation when the US Congress passed the *National Environmental Policy Act of 1969* and Federal environmental responsibilities were consolidated into the newly formed Environmental Protection Agency a year later. In 1972, the *United Nations Conference on the Human Environment* was held in Stockholm and declared “the need for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment” (UNEP 1972, preamble). In 1967, NASA’s ATS-3 satellite returned the very first colour photo of Earth from space. Lower in resolution than the famed ‘Blue Marble’ photo of 1972, it nonetheless captured a dynamic, life-harboured world against the pitch-black nothingness of outer space. The photo was soon released by NASA as a result of campaigning from activist Stewart Brand (Bjørnvig 2013, p.10), who used this image on the cover of the DIY guide to self-sufficiency, the *Whole Earth Catalog* (1968-1972). Kilgore eloquently describes the era: “for the first time in history humanity saw the true compass of its world, and some understood its small scale and fragility” (2003, p.153).

In addition to the ‘Blue Marble’ photo and the final Apollo mission, 1972 also saw the publication of the *Limits to Growth* report, produced by a team of environmental scientists at the Massachusetts Institute of Technology (MIT) led by Donella Meadows (Meadows et al. 1972). With MIT engineer Jay Forrester, the researchers built a computer simulation that processed observable, global trends of “accelerating industrialization, rapid population growth, widespread malnutrition, depletion of nonrenewable resources, and a deteriorating environment” (Meadows et al. 1972, p.21). The mathematical model projected that if these trends continued unabated, “the limit to growth on this planet will be reached sometime within the next one hundred years” (ibid, p.23). They argued, however, that a “global equilibrium” state could be reached: every human could have their basic needs met and “an equal opportunity to realize his individual human potential” under conditions of “ecological and economic stability” (ibid, p.24). The *Limits* report claimed that, if the consequences for exceeding the limits to growth were to be averted, society would need to exist in a steady state, with growth decelerated in developed countries and permitted only to raise the living standards of developing countries. Such a feat would require “concerted international measures and joint long-term planning” (ibid, p.194).

O'Neill was profoundly optimistic about the potential of technological innovation and rejected the 1970's 'bleak chic' and the steady-state goal (Michaud 1986, p.58). His anticipatory research project aimed to bypass – rather than work within – planetary limits. He published two seminal texts that articulated notions of *in-situ* resource utilisation, space manufacturing and space colonisation that are now central to NewSpace and its space mining project. The first was published in *Physics Today*, 'The Colonization of Space' (O'Neill 1974), and the second (and more widely known today) was *The High Frontier* (1977) – the culmination of close to a decade of work trying to turn space colonisation into a feasible project.²² Like the early 'visioneers' Tsiolkovsky, Goddard and von Braun (McCray 2013), O'Neill's *High Frontier* was a detailed synthesis of space utopianism and space engineering. It fused mathematical extrapolations and space colony design with frequent appeals to social experimentation and renewal. It was lavishly illustrated with the utopian artwork of Don Davis and Rick Guidice. The cylindrical and torus-shaped habitats he presented ranged from 1km to 32km in length and represented the "most effective geometry" for producing artificial gravity and a day-night cycle, harnessing natural sunlight and creating "an earthlike appearance" that could abound with living space, parkland, water bodies and agriculture (O'Neill 1974, p.33). O'Neill had designed and mounted a case for literal, artificial 'spaceship Earths' that he hoped would negate any terrestrial limits to growth.

The Saturn V rocket that carried the Apollo astronauts could carry a payload of 140 metric tons to low-Earth orbit; some of O'Neill's 'islands' would need upwards of 3 million tons of construction materials delivered well-beyond the edge of Earth's atmosphere (O'Neill 1977, p.127). With that mass, they could never be launched from Earth – the colonies would require mining and processing of resources found outside Earth's gravity well. O'Neill identified the Moon as "a rich source of both titanium and of aluminium" for building the habitats (1974, p.33). He engaged his background in high energy physics to design the 'mass driver': a "recirculating conveyor belt" powered by magnetic propulsion that he imagined could launch "3.6 million tons of lunar material over a six-year period" to the sites of habitat construction (ibid, p.138). Shipping materials from the asteroid belt would eventually be more cost effective, he thought, because their lack of mass and lower gravity would reduce the escape velocity for take-off. The prospective space mining industry shares this aspiration to off-world resource extraction and processing.

²² I will henceforth refer to this work as 'the *High Frontier*', despite it deriving from two texts.

Space colonisation and off-world industry proposed a solution to planetary ecological limits. This solution was predicated on engineering and innovation, not international governance or economic planning as envisioned by the *Limits* report. In keeping with his original aims with the Physics 103 course, *The High Frontier* involved numerous ‘blue sky’ speculative engineering proposals. They were ‘techno-fixes’ that assumed exponential technological progress would remedy endogenous social and ecological crises (Clark & York 2013). Grand ‘techno-fixes’ like space colonisation would negate the need for curtailing unsustainable industrial growth by opening new spaces for resource exploitation, population growth and waste output. There is a striking contrast between O’Neill’s recognition of the fundamental importance of the biosphere and his optimistic belief that space engineering would render these limits surmountable. The Apollo Program revealed that keeping three astronauts alive in space is extremely difficult. In the forty years since O’Neill’s book was published, there have been no successful closed-system biospheres capable of sustaining a human presence in deep space (Walker & Granjou 2017). Yet O’Neill simply pointed to the asteroid belt, where carbonaceous chondritic asteroids can provide carbon, nitrogen and hydrogen in abundance (O’Neill 1977, p.57-58). These are key ingredients in supporting life, and O’Neill proposed that each of his artificial biospheres could support over 10,000 people (ibid, p.92). His hugely speculative calculation was that the “the ultimate size limit for the human race on the newly available frontier is at least 20 000 times its present value” (O’Neill 1974, p.32).²³

Despite his cosmopolitan claims to ‘humanise’ outer-space, O’Neill’s off-world expansionism was also deeply individualistic. It represented more than an escape from ecological limits: it was also an escape from the limits to individual liberty that an economic ‘steady state’ would entail. O’Neill confessed that he had:

“always felt strongly a personal desire to be free of boundaries and regimentation. The steady state society, ridden with rules and laws, proposed by early workers on the limits to growth was, to me, abhorrent” (in Kilgore 2003, p.159).

Unlike the conclusion reached by the *Limits* researchers, “freedom and individual worth” could exist in and would indeed require a boundless economic base (ibid, p.230). For O’Neill and more recent advocacy from NewSpace, individual freedoms require the freedom to expand (e.g.

²³ I return to NewSpace technofixes and post-limits discourse in Chapter 6.

Alliance for Space Development 2019, p.3). In spite of O’Neill’s original intentions to use space engineering as a means of addressing the problems caused by industrialism, his solution was instead a means of escaping ecological catastrophe without taking responsibility for it.

O’Neill’s version of freedom was what political philosopher Isaiah Berlin (1969) described as ‘negative liberty’: freedom understood as the absence of imposed constraint, an “escape from outside interference”, in O’Neill’s words (cited in Kilgore 2003, p.168).²⁴ In his belief that “held by law to a steady state condition, freedom of thought and of inquiry would be dangerous and would probably be suppressed” (in Kilgore 2003, p.159), O’Neill echoed a conclusion reached by the then famous neoliberal economist and MPS co-founder, Milton Friedman. Friedman had argued that “‘freedom’ in economic arrangements is itself a component of freedom broadly understood...an indispensable means toward the achievement of political freedom” (Friedman 1962, p.15).

Ostensibly an anticipatory project grounded in maths and physics, O’Neill tried to distance himself from the utopian tradition. O’Neill had “said nothing about the government of space communities” and claimed to make “no prescription for social organization or governance” (in Kilgore 2003, p.169). There is no textual citation of libertarian or neoliberal philosophy in the *High Frontier*, yet his work is compatible with the Friedmanite abrogation of corporate responsibility and his hostility towards ecological economics. Friedman believed that forcing the monopolist to “discharge his power not solely to further his own interests but to further socially desirable ends...would destroy a free society” (Friedman 1962, p.106). Corporations have a social responsibility to produce a profit, nothing more. The businessman who makes “expenditures on reducing pollution beyond the amount that is in the interest of the corporation or that is required by law in order to contribute to the social objective of improving the environment” was “preaching pure and unadulterated socialism” (Friedman 1970). In this sense, there were early signs of resonance between NewSpace and neoliberalism, as O’Neill’s abrogation of enforced environmental responsibility mirrored Friedman’s critique of the ‘socially responsible corporation’. The relationship between the two movements would become more explicit during the following decade.

²⁴ Berlin characterised an alternative of ‘positive liberty’, in which an individual’s capacity for autonomy, self-realisation and independence (1969).

1.2.2 Fiscal crisis, budgetary limits and the end of 'old space'

The 1970s saw macroeconomic change that derailed the post-war economic boom and signalled the end of NASA's 'golden age' of state patronage. This is a key step in the emergence of NewSpace and its insistence on independent, commercial space exploration. Prompted by the balance of payments crisis, stagflation and the OPEC oil embargo, the American economy confronted (and bypassed) the apparent inability to run an unlimited deficit. In this context, O'Neill's lobbying work encountered a political establishment that was disinterested in space colonisation, yet he also inspired torchbearers of what is now the NewSpace movement. The Nixon Administration's (1969-1973) abandonment of the gold standard also spurred the development of speculative venture capital markets that would become influential in Silicon Valley start-up culture and the emergence of space mining firms.

The 1971 balance of payments crisis curtailed US economic growth. According to the Bretton Woods monetary agreements, exchange rates were fixed to the US dollar and the dollar would be convertible at a fixed rate to gold, of which the US owned roughly half of global reserves. Gold was the "monetary medium that checked America's ability to run balance-of-payments deficits without limit" (Hudson 2003, p.x), and "foreign central banks could always hold the world's banker to account by exchanging their surplus dollars for gold" (Cooper 2007, p.29). This system was put under significant strain with huge deficits run by the US, due largely to its expenditure on the Vietnam War. Foreign central banks held more US dollars than the value of gold in US reserves; when a host of European countries sought to redeem their dollars for gold, Nixon ended the gold convertibility of the dollar in August 1971.

The first oil shock of the decade also damaged the American economy, and simultaneously lent further credibility to the *Limits to Growth* thesis' projections of increased resource scarcity. In 1973-74, the Organisation of Arab Petroleum Exporting Countries (OAPEC) launched an oil embargo in response to US support of Israel in the 1973 Yom Kippur War. Energy security in the US was significantly diminished: the cost of petroleum increased due to widespread shortages, which increased production costs for large sections of the American economy. American manufacturers also began to suffer from increased international competition, with Europe and Japan recovering from the devastation of WW2. The US economy was in a state of stagflation, with high inflation and high unemployment coinciding with low economic growth.

Political economist Melinda Cooper's (2008) *Life as Surplus* (2008) offers some observations that describe the pre-conditions that gave rise to NewSpace start-ups. She highlights how the twin crises of ecological and monetary limits were instrumental in the development of commercial life sciences like pharmaceuticals, bioengineering and agribusiness. After Nixon's abandonment of the gold standard, the US became an "empire curiously devoid of tangible reserves or capital" (Cooper 2008, p.29). Daniel Bell's *The Coming of Post-Industrial Society: A Venture in Social Forecasting* (1973) was another futurological, techno-optimistic project that gained popularity alongside O'Neill's work. Cooper notes how Bell's 'post-industrialism' became influential in right-wing futurists' rejection of limits discourse (for example, Simon & Kahn 1984). Central to the 'post-industrial society' was an innovation-based 'knowledge economy', where the "creativity of the human mind (a resource without limits) would replace the mass-production of tangible commodities" (Cooper 2008, p.17). Discourses of the 'post-industrial' society were actively deployed in the Reagan Administration's R & D policy a decade later. This faith in the intangible 'spirit' of innovation over the recognition of biophysical limits to expansion remains central to NewSpace techno-utopian discourse (e.g. Zubrin 1994).

The financial reforms originating in the 1970s ultimately opened up more capital for speculative 'knowledge economy' investment and led to the accumulation of personal fortunes that were invested in NewSpace start-ups decades later. Following the OAPEC oil embargo, the US pursued deepened military and economic partnerships with Saudi Arabia. Bilateral agreements and US pressure via Saudi Arabia pushed other Middle Eastern oil exporters to standardise oil sales in US dollars. This meant that the dollar was backed by oil demand, and the huge amounts of 'petrodollars' accumulated by oil producers would be recycled back into US financial markets, creating a huge pool of funds for investment. No longer limited to the bullion of the Federal Reserve, the US stock market became increasingly liquid and mobile: a large pool of funds became available for highly speculative investments in high-risk shares, junk bonds and venture capital funds (Cooper 2008, p.27). These venture capital (VC) funds started investing in information and communication firms from the late-1970s onwards – and these investments fuelled further capital mobility through the digitisation of economic exchange. The increased mobility of capital also facilitated the transfer of vast sums of money to lowly-taxed off-shore principalities – such as Luxembourg, which is now an investor in space mining firms.

The US fiscal crises of the early 1970s simultaneously precipitated these financial

reforms and reduced the national budget for space science and engineering. Against the backdrop of economic turmoil and falling government revenue, the Nixon Administration gradually cancelled the Apollo missions. In 1969, the year of the Moon landing, the NASA budget had nearly halved from its 1965-66 peak, down to 2.3% of the national budget (OMB 2019; Table 1, above).²⁵ After achieving six crewed Moon landings, Apollo 20 was cancelled in January 1970 and Apollos 18 & 19 were cancelled in September 1970. In 1972, when Apollo 17 marked the last time a human set foot on the Moon – taking its memorable ‘blue marble’ photo along the way – NASA’s share of the national budget had dropped to 1.5% (OMB 2019). In 1975, for the first time since Kennedy’s famous 1962 declaration of intent, it dropped below 1.0% and has not exceeded this level since (OMB 2019).

While early ‘visioneers’ like von Braun had hitched idealistic space aspirations onto the national military agenda, O’Neill and anyone else would struggle to gain comparable support from the US Government (Kilgore 2003, p.151). Kilgore describes how, in pursuing follow-ups to Apollo, NASA “scrambled for political and fiscal survival in congressional hearing rooms”, lacking the broader support of the American voting public for the cause of space exploration (ibid, p.151). As Michaud recounts, “The ordinary voter...saw no point in continuing to pour huge amounts of money into the space program once the prestige and confidence of the United States had been restored” and the ‘race’ had been won (Michaud 1986, p.15). Thousands of engineers, technicians and scientists were pushed outside the national space program (Kilgore 2003, p.151). The golden age of space travel had come to an end.

As far as Gerard O’Neill was concerned, it proved to be an inopportune time to ask the US Government to fund 32km-long spaceships that had their own “skiing, sailing [and] mountain climbing” facilities (O’Neill 1974, p.36). O’Neill would spend several years taking his ideas to Capitol Hill in search of funding and commitment from legislators to support the humanisation of outer space, which would ultimately never arrive. He had some minor successes, including NASA Ames workshops that culminated in the *Space Settlements: A Design Study* (Johnson & Holbrow 1975) and the *Space Resources and Space Settlement* reports (Billingham & Gilbreath 1977). O’Neill also received a “good reception” at the 1978 ‘Future Space Programs’ hearings of the House Committee on Science and Technology (Gluckman 1978, p.5).

There were select ‘pro-space’ voices in Congress at the time, predominantly from the

²⁵ Incidentally, this is also the year when O’Neill was rejected by the US astronaut corps (Michaud 1986, p.60).

political right. Michaud's (1986) history of pro-space notes the following: Harrison Schmitt (R-NM; 1977-83), former Apollo 17 astronaut-geologist and later lunar mining advocate; Don Fuqua (D-FL; 1963-87), who proposed an unsuccessful 'Space Industrialization Act' in 1979; Ken Kramer (R-CO, 1972-87), who in 1982 proposed the creation of a US Space Force (a new branch of the military, recently realised by the Trump Administration); and Newt Gingrich (R-GA, 1979-1999), a consistent libertarian voice in American politics, who recently advocated for a widely ridiculed Moon Base proposal during the 2012 Republican primaries (Michaud 1986, p.74, p.217, p.231). However, broader government support under the austerity budgets of the Carter Administration (1977-81) was not forthcoming. O'Neill's *High Frontier* proposal was often received with incredulity, most famously by Sen. William Proxmire (D-WI, 1957-1983).

"A space station for one million inhabitants would require financial resources beyond anything currently imaginable without any prospect of economic return. Therefore, I have concluded that any funds spent on space colonization is simply a waste given the massive problems remaining to be solved here on earth." (Proxmire, in Gluckman 1978, p.5)

O'Neill received greater support from sections of America's burgeoning counter-culture movements. The widespread interest in the 'Colonization of space' paper (O'Neill 1974) owed much to the support of Stewart Brand's Portola Foundation, publisher of the *Whole Earth Catalog* and a funding source for O'Neill's 'First Princeton Conference on Space Colonisation' held in May 1974 (Kilgore 2003, p.161). His work also received free publicity from LSD-advocate Timothy Leary, for whom space settlements heralded the dawning of directed human evolution (McCray 2013, p.10). Leary's endorsement sat uneasily with O'Neill, the tenured Ivy League physics professor, while the financial support of communitarian environmentalists like Brand "was a last resort" after years of unsuccessful attempts at securing more credible, 'establishment' funding sources (Kilgore 2003, p.161).

Michaud identifies a three-stage cycle of space advocacy that aptly summarises O'Neill's experiences:

"...first, enthusiasm about the big idea and a desire to communicate it with others. Second, the encounter with the realities of government and politics, leading to frustration. Third, the scaling down of near-term goals and their pursuit by indirect or private means" (Michaud 1986, p.81).

It is this pursuit of space colonisation and interrelated mining, manufacturing and industrialisation projects through ‘indirect or private means’ that paves the way for NewSpace mining start-ups. In 1978, O’Neill and his wife Tasha founded the Space Settlement Institute (SSI) through private philanthropy, for the purpose of organising “small groups of people to develop the tools of space exploration independently of governments and to prove that private groups could get things done enormously cheaper and quicker than government bureaucracy” (Dyson 1993, p.98). It is an entrepreneurial form with a libertarian ethos, reflecting the neoliberal aversion to centralised planning.

Several key figures in contemporary NewSpace draw their inspiration from O’Neill. One of O’Neill’s protégés at SSI was Rick Tumlinson, a torchbearer of the NewSpace movement who co-founded the civil society group Space Frontier Foundation in 1988 (with former Gingrich staffer James Muncy) and space mining start-up Deep Space Industries in 2013. O’Neill’s outreach work also inspired young entrepreneur Peter Diamandis, who founded Students for the Exploration and Development of Space (SEDS) in 1980 and co-founded Planetary Resources in 2012. Bob Richards established a SEDS chapter in his native Canada during his youth and co-founded the space mining and transportation company Moon Express in 2010.

The most famous of Gerard O’Neill’s students is Jeff Bezos, founder of the online retail behemoth Amazon.com and aspiring launch services company Blue Origin. At Princeton, he had seen O’Neill’s lectures and, as with Richards and Diamandis, was president of his local SEDS chapter (Gruss 2016). In a May 2019 presentation titled, ‘Going to space to benefit Earth’, Bezos unveiled Blue Origin’s new lunar lander, discussed mining lunar water ice and re-capitulated the O’Neillian imaginary of limitless growth via rotating orbital colonies (Blue Origin 2019). The world’s richest person – with an approximate individual wealth of US \$155 billion (Sanders, in Johnson 2018) – is now showing CGI renders of *High Frontier*-style space cylinders to a new generation of space enthusiasts.

Bezos has deployed quintessentially neoliberal business strategies in accumulating his staggering wealth: Amazon pays very little corporate tax in the US, and has made use of off-shore jurisdictions like Luxembourg (Abrahamian 2017); has near-monopolistic control of supply chains stocked with low-wage labourers who have been actively discouraged from unionising (Johnson 2018); it encouraged a ‘race to the bottom’ between sub-national jurisdictions before deciding on the location of its second corporate headquarters, and many

states proposed using taxpayer funded incentives to this end (Wingfield 2018);²⁶ and, as the Poynter Institute have discussed, in 2018 the company made political donations to “68 legislators who have denied climate change – including those who have voted against environmental legislation 100% of the time” (Mahadevan 2019). Despite his moments of libertarian bluster, O’Neill appeared to make a sincere attempt to address the problems of his day. It is hard to reconcile Amazon’s history with Bezos’ claim to be ‘going to space to benefit Earth’.

So far, Bezos’ Blue Origin has been successful in reaching low-Earth orbit, while *High Frontier*-inspired space mining spacecraft are yet to leave the ground. Precisely what influence Gerard O’Neill will have on space colonisation remains to be seen. In politico-legal terms, however, his ideas have already been quite influential. Perhaps the most significant chapter in O’Neill’s legacy will have been through the formation of an advocacy group called the L-5 Society. Through the L-5 Society, private property rights to off-world resources became part of the NewSpace policy programme. Their lobbying work established a link between NewSpace and neoliberalism, forged in opposition to international treaty law that sought to constrain extractive industry in the global commons.

1.2.3 The L-5 Society and the defeat of the Moon Agreement

In 1772, the mathematician and astronomer Joseph-Louis Lagrange observed peculiar orbits of ‘Trojan’ asteroids that share the same path as Jupiter around the Sun. One group was always sixty degrees ahead of Jupiter in its orbit, another always sixty degrees behind (O’Neill 1977, p.128). He had discovered what became known as ‘Lagrange-points’, or ‘L-points’: “stable points, near which any object with the correct initial location and velocity would stay forever” (ibid, p.129). L-points were also evident in the Earth-Moon system, where the confluence of gravitational influence from the two celestial bodies produced stable regions around which an artificial satellite could orbit, trailing behind the Moon in its orbit around the Earth. Gerard O’Neill considered that the L-5 point in the Moon’s orbit was “far enough from Earth and Moon to avoid frequent eclipses, so the community can use free solar power continuously” (ibid, p.128). Equidistant with the Moon, the L-5 point is approximately 380,000km away from the

²⁶ Harmes has described this sort of sub-national ‘race to the bottom’ as ‘neoliberal federalism’ (2012, p.66-67).

Earth, significantly further than the 400km altitude of the International Space Station – presently the most successful long-term human habitat in space.

O'Neill's *High Frontier* inspired a group of civilian enthusiasts that banded together as the L-5 Society. Based in Tuscon, Arizona, the L-5 Society was founded by Carolyn Meinel and Keith Henson, a couple who had met O'Neill in the wake of his first *High Frontier* publication (O'Neill 1974; Henson & Henson 1975). In advocating O'Neill's ideas, L-5 recruited new members with a level of tenacity and flair perhaps exceeding that of other grassroots movements of the period, such as Brand's Portola Foundation. A nationwide 'telephone tree' was developed so L-5 members could recruit new members into lobbying their Congressional representatives by phone (Brandt-Erichsen 1994). Meinel established a hotline called the 'Legislative Information Service' that would keep members abreast of developments in the Carter Administration's space policy (Michaud 1986, p.89). Meinel began producing the monthly *L-5 News*, bringing the utopian imagery of the *High Frontier* to a wider audience.

Some interesting figures were drawn to the organisation in its early years, and several possessed interests in both futurism and economic liberalism. This included Mark Hopkins, later an economist with the RAND Corporation; K. Eric Drexler, a founder of the MIT Space Habitat Study Group and later advocate for utopian applications of nanotechnology; Hans Moravec, a robotics scientist at Carnegie Mellon University and later active in transhumanist thought and advocacy; and Herman Kahn, a civil defence strategist at RAND (Michaud 1986, p.83).²⁷ McCray notes that Drexler was interested in the private property freedoms of Hayek and the 'minimal state' anarcho-capitalism of Robert Nozick, whose *Anarchy, State and Utopia* (1974) was influential in the establishment of neoliberal interest groups in the same period (McCray 2013, p.173).²⁸ Kahn represents a particularly intriguing connection between the L-5 Society and neoliberal futurology, having later been commissioned by the Heritage Foundation and Reagan Administration to provide a pro-growth, right-wing response to the *Limits to Growth* report and the environmental reforms of the Carter Administration (Cooper 2008, p.17; Granjou, Walker & Salazar 2017, p.8).

The late-1970s saw space enthusiasm move towards the pro-commerce policy platform

²⁷ The economics division at RAND Corp contained several Mont Pèlerin Society members (such as Armen Alchian). I discuss RAND's influence on American space policy further in Chapter 4.

²⁸ While they seem to have taken little interest in O'Neill's ideas, the Heritage Foundation (1973) and the Cato Institute (in 1974) were founded in this period.

that is evident in contemporary NewSpace.²⁹ The Carter Administration (1977-1981) was not popular with the L-5 Society.³⁰ Following Nixon and Gerald Ford (1974-1977), Carter had de-prioritised the space program, and NASA pursued goals that were modest compared to their Apollo achievements. Carter entered the White House in the aftermath of economic recession, and a second oil shock occurred in 1979 (following the Iranian Revolution). Yet NASA funding under Carter was not insubstantial, despite the absence of any commitment to manned missions beyond the Moon or any other pathways to the O’Neillian frontier. The Space Shuttle program was announced by Nixon in 1972 as an attempt at more affordable (and reusable) launch services. The first space station, *Skylab*, orbited between 1973-1979. By 1977, the first Space Shuttle test flights commenced with the *Enterprise* – its name foreshadowing the pivot towards space commerce that would soon arrive with the Reagan Administration.

The L-5 Society was unconvinced that space colonisation would progress under Carter. Michaud’s (1986) social history of American space enthusiasm is particularly valuable in accounting for L-5’s emergence between 1975-81 as the most politically active ‘pro-space’ organisation. Meinel and Henson had unsuccessfully attempted to get space colonisation on the agenda for the 1976 UN Committee on Peaceful Uses of Outer Space, but continued lobbying Congress in support of O’Neill’s space colonisation agenda (Michaud 1986, p.87). O’Neill’s post-Earth environmentalism lived on through L-5. Slogans included ‘Declare Earth a wilderness area’ and ‘If you love it, leave it’ (ibid, p.89). Alongside this conservationist discourse, L-5 members took increasing interest in the possibility of commercial exploitation of space resources – both as a means of making space colonisation independent from government funding *and* on the level of self-interest. L-5 founder Keith Henson remarked, “I’m going to be a billionaire. A lot of us are” (in Michaud 1986, p.246).³¹

²⁹ As a point of contrast, The Planetary Society (founded 1980) was a much larger pro-space organisation that was more interested in the exploration and scientific understanding of space than its colonisation. Carl Sagan was a co-founder of this organisation, and Michaud notes that Sagan had actually found professional political lobbying to be morally disagreeable, preferring to advocate for space funding through more antiquated means like encouraging members to write to their Congressmen (Michaud 1986, p.212)

³⁰ Carter also became something of a hate-figure for the simmering neoliberal political movement: he introduced environmental protection measures like pesticide bans, atmospheric pollution controls and promoted solar energy, most famously installing solar panels on the White House roof.

³¹ O’Neill eventually distanced himself from L-5 for fears of his own reputation as a respected physicist, and by 1984 referred to them dismissively as ‘those people in Arizona’ (in Michaud 1986, p.88).

In 1978, the L-5 Society began their most notable political campaign – a lobbying project that had a significant impact on international space resources law. The United Nations’ *Moon Agreement* (1979) was negotiated in the UN from 1972 and opened for signature in 1979. This treaty described celestial bodies and their resources as the ‘common heritage of mankind’. This *Agreement* went further than the ‘province of all mankind’ language of the *Outer Space Treaty* (1967), by explicitly prohibiting unilateral, private appropriations of space resources. Further, it stated that, when off-world mining became technically feasible, the international community would establish “an international regime...to govern the exploitation of the natural resources” and distribute economic and technological benefits to all nations (Art. 11, para. 5). If national governments could no longer be relied on to support large-scale space projects, commercial investment was needed. If the Treaty was widely ratified, the argument put forth by L-5 was that private capital would be discouraged from participating in space colonisation due to new restrictions on unilateral resource extraction – thus posing a significant hurdle for the O’Neillian vision. Marking the occasion with militant rhetoric and launching their campaign on the most nationalistic date in the American calendar, L-5’s Henson proclaimed that:

“On the fourth of July 1979, the space colonists went to war with the United Nations of Earth... The treaty makes no provisions for the civil rights of those who go to into space...The ‘common heritage’ provisions of the Treaty will stifle creative private initiative by prohibiting private property, and limits the economic system to a single undefined ‘Regime’ ...The treaty makes as much sense as fish setting the conditions under which amphibians could colonize the land” (Henson 1980).

Through the L-5 Society’s opposition to the *Moon Agreement*, private property entered the NewSpace policy program largely as a reactive measure against international laws of the global commons.

In order to defeat the Treaty, the L-5 Society hired lawyer-lobbyist Leigh Ratiner in 1979, a former US public official who would eventually work as a lead negotiator on the third convention of the United Nations *Law of the Sea* (UNCLOS III 1982). The UNCLOS III treaty proposed similar restrictions on private mineral ownership in the deep seabed. Ratiner was employed to foment opposition in Washington to these two treaties – by a consortium of international mining firms opposing UNCLOS III and by the L-5 Society opposing the *Moon Agreement* (Michaud 1986, p.90-93). In 1979-80, Ratiner had successfully lobbied the Carter

Administration to suspend action on signing the *Agreement* (Michaud 1986, p.92). The Carter Administration was prepared to sign the *Agreement*, but – in the L-5 Society’s words – the newly elected Reagan Administration (1981-89) considered the Treaty a “dead issue” and would not “submit the treaty for ratification to the Senate” (‘UN Moon Treaty falling to US opposition groups 1982’). As part of a consistent foreign policy platform across the two treaties, the Reagan Administration (and ensuing US governments) refused to sign the *Moon Agreement* and did not recognise the mining provisions of UNCLOS III. The *Moon Agreement* was politically less significant than the UNCLOS restrictions on deep sea bed mining (which was considered more feasible and profitable at the time).

As far as I am aware, my project is the first to probe the potential linkages between neoliberal networks and US opposition to the *Moon Agreement*. Further archival research is needed. Through Ratiner, however, we can see a potential connection between the early networks of NewSpace and American neoliberalism. The fact that the Reagan Administration refused to ratify the *Agreement* is likely to have involved some cross-pollination between the concerns of the L-5 Society and those of the US’s UNCLOS III negotiating team. Ratiner was the Deputy Chairman and Chief Negotiator of the US delegation. Among his colleagues were Doug Bandow and James Malone (see, for example, ‘Telegram from the mission to the United Nations to the Department of State’ 1981). Bandow and Malone were both former writers with MPS-linked think-tanks, the Cato Institute and Heritage Foundation, respectively. Writing for Heritage, Bandow later remarked that “space entrepreneurs, whose numbers are growing, would face increased uncertainty” under the *Moon Agreement* (Bandow 1985, p.4). This implies an awareness of L-5 concerns. He went further, offering a Hayekian elision of distributive international governance with tyrannical authoritarianism: “The philosophy of world socialism logically requires the creation of large-scale coercive institutions – like ‘international authorities’ to regulate the seabed and outer space” (ibid, p.2). Malone, meanwhile, had authorised Ratiner’s UNCLOS consulting fees, which raised eyebrows on Capitol Hill (Miller 1982). One Senator noted the neoliberal blurring of public and private power, remarking that Malone “was warned repeatedly about the impropriety of serving industry clients and State Department policy makers simultaneously” (Cranston, in Miller 1982). In the wake of UNCLOS, Malone noted concerns about “the grave danger of legitimising this socialist concept” of ‘the common heritage of mankind’, because doing so meant that it could be “applied in other areas such as the Antarctic

and outer space” (Malone 1983, p.31). These apparent working relationships between Ratiner and former think-tank staffers employed by the Reagan Administration would suggest that the L-5 Society had (perhaps inadvertently) drawn upon neoliberal political connections in their assault on the *Moon Agreement*. At the dawn of American neoliberal government, an attempt to codify common property arrangements in outer space was severely undermined.³²

As much as the L-5 Society (now the National Space Society) has enjoyed counting the defeat of the Moon Agreement among their otherwise limited political triumphs (Brandt-Erichsen 1994), Michaud makes the apt summation that the episode demonstrates “the value of weak interest groups having more powerful allies” (Michaud 1986, p.93). My view is that they were neoliberal allies. The L-5-*Moon Agreement* episode is a watershed moment in space advocacy where – through their opposition to international governance and laws of global commons – early NewSpace moved quite quickly from a broad-based libertarianism directed against an uncooperative national government and into a distinctly neoliberal position where the ‘strong state’ is directed to attack an international legal order attempting to constrain private appropriation. It is a fascinating transition. In the mid-1970s, the L-5 Society was enmeshed within American counter-culture movements, publishing interviews with Timothy Leary (Robinson 1976, p.6). By 1981, L-5 had aligned itself with the foreign policy directions of the Reagan Administration. This dispute over the international governance of off-world resource appropriation – resolved in favour of embryonic NewSpace – paved the way for the private property guarantees of the *Commercial Space Launch Competitiveness Act* (2015).

From 1983, O’Neill himself became an entrepreneur, most notably through his GEOSTAR satellite positioning project (Michaud 1986, p.79). The Reagan Administration “recognized his status as an advocate of the private sector” and appointed O’Neill to serve on the National Commission on Space (Dyson 1993, p.98). Part of the Reagan Administration’s reappraisal of US space policy, the Commission’s 1986 report outlined a ‘Pioneering Mission for 21st Century America’:

“To lead the exploration and development of the space frontier, advancing science, technology, and enterprise, and building institutions and systems that make accessible vast new resources and

³² The defeat of the *Moon Agreement* is a significant episode in the relationship between NewSpace, neoliberalism and the possibility of equitable human futures in space. I will return to it at numerous points in the dissertation.

support human settlement beyond Earth orbit, from the highlands of the Moon to the plains of Mars” (National Commission on Space 1986).

Following O’Neill’s death in 1992, Freeman Dyson – his friend and an ongoing advocate for space colonisation – penned an obituary that described O’Neill as an “effective and enthusiastic” teacher, who took “infinite trouble to get the details right” and an outsider prepared to stand up “against the established wisdom” (1993, p.98). ‘Established wisdom’ would change, however. A new neoliberal agenda for space research would look to the private sector when pushing back the space frontier for US interests. The strong state and free economy would be projected onto an alternate ‘High Frontier’ (Graham 1982), re-characterised as the military high-ground in a re-escalating Cold War.

1.3 1980 – present: the emergence of private property rights and space mining start-ups

This final section focuses on two core developments that bring us to the present day. On one hand, the development of a neoliberal program in ‘mainstream’ space policy. On the other, the proliferation of NewSpace start-ups and civil society groups, and the ascendance of a pro-commerce and anti-statist idiom within them. The Reagan Administration (1981-1989) undertook commercialisation reforms that reconfigured NASA’s role in the ‘public-private partnership’: the Apollo-era Keynesianism morphed into the pursuit, “to the maximum extent possible, [of] the fullest commercial use of space” (*National Aeronautics and Space Administration Authorization Act of 1985* s.102). I argue that the emergence of space mining firms and the passage of the *Commercial Space Launch Competitiveness Act* (2015) is the culmination and synthesis of these two developments. By the 1990s, new entrepreneurs are drawn into the space industry by Reaganite reforms. By the 2000s, libertarian NewSpace secures the backing of the neoliberal Atlas Network. In the 2010s, space mining start-ups emerge with the funding of Silicon Valley fortunes. Now, the high frontier would appear to be open for (state-supported) business.

1.3.1 *The high frontier of Reaganite neoliberalism*

While the L-5 Society was fighting the *Moon Agreement*, neoliberalism had begun to penetrate public discourse and public institutions. The Thatcher Government (1979-1990) and Reagan Administration (1981-1989) became the first Western neoliberal governments.³³ The 1980s involved a realisation of the ideas established in the Mont Pèlerin Society (MPS) and the Chicago school of law and economics, with the US and UK governments devolving the state's provision of goods and services to corporate firms. New markets were created for public utilities like energy, water, education, health and public safety. Reagan aggressively pursued economic growth and attacked the social democratic Great Society and New Deal welfare reforms, enacted massive cuts to education budgets and the EPA, and pushed pro-market reforms that included tax cuts for corporations and high-income earners, deregulation of telecommunications industries, expansive granting of oil drilling licenses and the commercialisation of national R & D projects (to name a few). In Reagan's second term (1984-1989), government support for space engineering and exploration increased. The simmering NewSpace movement found a government willing to restore space exploration to national prestige following its exile during the 1970s, albeit with a renewed emphasis on Cold War geostrategy and a new commercial orientation.

The 1980s also saw the consolidation of the neoliberal thought collective, from a loose array of Mont Pèlerin Society members into a coordinated transnational political network that has influenced US space policy (among many other policy fields). In 1981, English businessman Antony Fisher had founded the Atlas Economic Research Foundation, now known as the Atlas Network (Fisher founded London's Institute for Economic Affairs in 1964, which became a central think-tank for English neoliberalism under Margaret Thatcher's government). Neoliberal think-tanks like the Heritage Foundation and the Cato Institute became key Atlas nodes in the US. Today, it is a network amply-funded by corporate and private philanthropy, encompassing "more than 450 think tanks in nearly 100 countries" and committed to a "vision of a free, prosperous and peaceful world where the rule of law, private property and free markets are

³³ Fischer (2009) describes role of the Chicago School in introducing neoliberal reforms following the 1973 Pinochet coup in Chile, which pre-dated the Thatcher and Reagan governments (which I discuss in section 3.2.3, p.132, footnote 68).

defended by governments whose powers are limited” (Atlas Network 2018). Plehwe notes that most of these think-tanks “have been founded and are run with the help of at least one MPS member” (2009, p.35, footnote 6). One example is the Reason Foundation. Its monthly magazine, *Reason*, has served as a mouthpiece for libertarian and neoliberal thought, often publishing works from Ayn Rand and Milton Friedman.

The earliest instance I have seen of NewSpace discourse being communicated through an Atlas member organisation appears in a 1981 issue of *Reason*. In 1981, writer James Bennett offered a view on the American space program that perfectly summarises contemporary NewSpace.

“For too long advocates of private enterprise have been torn between an admiration for the magnificent accomplishments of space explorers and an uneasiness at the domination of the field by a giant government bureaucracy. The time has come for policy decisions that will move the field of space development forward by getting the government out of humankind's newest arena of endeavor and replacing it with the creative, innovative approach of entrepreneurs” (Bennett 1981).

Bennett offers a clear example of the Hayekian aporia of claiming to “make as much use as possible of the spontaneous forces of society” while also “deliberately creating a system within which competition will work as beneficially as possible” (Hayek 1986, p.13). Bennett asserted that “the US Government should be doing all that it can, without active involvement, to further the establishment of a commercial, competitive merchant fleet in space” – this included privatising the Space Shuttle, limiting regulatory burden on private space operators and a “government that stands up for the freedom of commerce and refuses to sign agreements that infringe upon basic freedoms and rights” (Bennett 1981). The right to exploit off-world resources is supposedly one of these ‘basic’ rights. His call for “the government [to] clearly oppose any attempts on the part of international bodies to allocate space resources or to otherwise hamper commercial space operations by US citizens” was answered in the Reagan Administration’s refusal to sign the *Moon Agreement* (Bennett 1981).

Key developments in the neoliberalisation of the American space program can be attributed to other nodes in the Atlas Network. The Heritage Foundation took an interest in American space policy through the *High Frontier: A New National Strategy* report (in Graham 1982). This report had originated in the conservative American Security Council Foundation (a

military-oriented think tank that is not an Atlas member), but was sponsored and published by Heritage during Reagan's second year in office (Michaud 1986, p.228). The report served primarily as a pre-cursor to the Strategic Defense Initiative ('Star Wars') by introducing the concept of a defensive shield of anti-ballistic missile technology. The Heritage *High Frontier* report also borrowed from the O'Neillian high frontier.³⁴ Space would provide "zero gravity, near perfect vacuum, unlimited heat absorption, and sterile conditions" to aid commercial and industrial activity, alongside the familiar refrain that "space also contains inexhaustible supplies of minerals and solar energy" (Graham 1982). The report's author, retired Air Force officer Daniel Graham, fuses the Cold War containment paradigm with American exceptionalism and, like O'Neill, refused to accept any limits to growth.

"The United States is faced with an historic, but fleeting opportunity to take its destiny into its own hands. The ominous military and economic trends which today beset the peoples of the Free World can be reversed, and confidence in the future of free political and economic systems can be restored. To accomplish this, we need only take maximum advantage of one priceless legacy handed down to us by those free institutions—superiority in space technology. We can escape the brooding menace of "balance of terror" doctrines by deploying defensive systems in space. We can confound the prophets of doom by opening the vast and rich High Frontier of space for industrialization" (Graham 1982).

In Graham's view, the "government's role in opening up the High Frontier of space for economic exploitation is basically the same as it has been with the opening of frontiers of the past: exploration, transportation systems, and security" (ibid). A strong state, making the frontier safe for capitalism.

Reagan's 1984 State of the Union address returned outer space to the national limelight. His speech announced the Strategic Defense Initiative and a new space station program for America, following the modest success of *Skylab*. Perhaps predictably, it was to be called space

³⁴ Space sociologist Thomas Ellis describes how O'Neill was incensed that his moniker for peaceful space colonisation could be used for militaristic purposes (2016). Here is an early moment of tension between the humanitarian or cosmopolitan aspirations of NewSpace, and their overarching need for developing the space economy through state support (even when this involves non-peaceful purposes). For more recent examples, we could look to Elon Musk – arguably the most prominent NewSpace advocate – who has evoked the peaceful civilising mission of space colonisation (e.g. Musk 2017), while his SpaceX company receives multimillion dollar contracts for launching military satellites into Earth orbit (Ax 2018).

station *Freedom*.³⁵ Reagan's speech embedded the frontier mythos of outer space within neoliberal prerogatives of market-based competition, and the now familiar justification of private concentrations of wealth through the refrain of job creation.

“A sparkling economy spurs initiatives, sunrise industries, and makes older ones more competitive. Nowhere is this more important than our next frontier: space...Opportunities and jobs will multiply as we cross new thresholds of knowledge and reach deeper into the unknown” (1984).

The space sector was among other 'sunrise industries' like information and communication technologies (ICT) and the corporate life sciences (Cooper 2008). Two success stories from this period were Sun Microsystems of Palo Alto, California, and Microsoft in Seattle. During this period, Eric Schmidt (now with Google) and Charles Simonyi were employed by Sun and Microsoft, respectively; more recently, the two were founding investors in space mining start-up Planetary Resources. The burgeoning US ICT sector was also fuelled by financial reforms, including those that allowed pension funds to invest more speculatively – under Reagan, investment into VC funds increased tenfold (Lerner 2002, p.76).

The Reagan Administration commenced an “integration of public science and private profit” that remains characteristic of the neoliberal agenda for scientific research (Lave, Mirowski & Randalls 2010, p.664). Specific examples included the 'Bayh-Dole Act', which authorised universities and private sector firms to profit from “inventions arising from federally supported research and development” (*Patent and Trademarks Amendment Act of 1980*, s.200). For space research, the Office of Commercial Programs was created in 1984 and tasked with advocating commercialisation within NASA and liaising between NASA agencies, industries and university-based institutes (Bromberg 1999, p.122). Today, this 'public science for private profit' mandate is perpetuated through NASA's Technology Transfer Program, which 'spins-off' intellectual property into the private sector – ranging from image sensors for digital photography, to memory foam pillows and nutrient-rich baby formula derived from astronaut food.

I can only offer a brief exploration of the broader movements towards space commercialisation.³⁶ Under Reagan, the neoliberal turn in the American space program was

³⁵ Spiralling costs eventually transformed this project into what is now the International Space Station.

³⁶ In an attempt at brevity, I have largely omitted discussion of the most profitable sectors of space commerce: the commercial satellite industry.

enshrined in US public law. The *Commercial Space Launch Act* was passed (CSLA 1984), the titular precursor to the recent CSLCA. Whereas rocket boosters like the Saturn V had been built as part of industry-NASA collaboration, the CSLA turned the design and construction of these expendable components over to private business and NASA's role was reduced to that of customer. In the wake of the 1986 *Challenger* disaster, the 1988 'Presidential Directive on National Space Policy' further limited NASA from providing goods or services that could be turned over to the commercial space industry.³⁷ The Directive stated that:

“Governmental Space Sectors shall purchase commercially available space goods and services to the fullest extent feasible and shall not conduct activities with potential commercial applications that preclude or deter Commercial Sector space activities” (1988).

The Reagan Administration's neoliberalising of American space policy was confirmed through amendments to the *National Aeronautics and Space Act (NASA) of 1958*. The mandate of the world's pre-eminent space agency would move beyond seeking “the benefit [for] all mankind” (*NASA Act of 1958*). Through the *National Aeronautics and Space Administration Authorization Act of 1985*, the *NASA Act's* 'Declaration of Policy & Purpose' would henceforth be amended to include that:

“the general welfare of the United States requires that the National Aeronautics and Space Administration ... seek and encourage, to the maximum extent possible, the fullest commercial use of space” (*National Aeronautics and Space Administration Authorization Act of 1985*, s.102).

The foundations of a neoliberal mode of space exploration would be laid under Reagan. Now, the US state now supports an emerging space mining industry through laws that commodify outer space itself.

³⁷ These commercialisation reforms that emerged in the wake of the widely televised *Challenger* catastrophe could perhaps be considered a form of 'disaster capitalism' described by Naomi Klein (2007), whereby neoliberal policy reforms are introduced while publics are still in shock or mourning (and less capable of organising opposition to these reforms).

1.3.2 Commercialisation ‘to the maximum extent possible’: the emergence of NewSpace start-ups

In the last quarter of the 20th century, the bipolar superpower duel at the centre of Cold War spacefaring transitioned into a new multipolar ‘space economy’ replete with new state and corporate actors. To this day, military-industrial mainstays like Boeing and Lockheed-Martin have continued their lucrative cooperation with NASA, which implies that the ‘old’ and ‘new’ monikers offer only a faulty periodisation. Nevertheless, during the 1990’s and early 2000’s an array of civil society organisations and start-ups emerged within a fully-formed NewSpace network.

Commercial satellite activity in low-Earth orbit had proliferated and NASA’s Space Shuttle had to compete with international launch service providers. The multinational European Space Agency (ESA) was founded in 1964 and, from 1984, its Ariane Program carried scientific and commercial payloads to low-Earth orbit (LEO). One frequent customer of the Ariane program was the Luxembourg communications satellite company, SES. SES was founded in 1985 with the support of the Luxembourg Government and now has one of the largest satellite fleets in the world. Sky TV, owned by media baron and Atlas member, Rupert Murdoch, was one of SES’ first customers. The recent Luxembourgian space resources law seeks to build on the success of SES and leverage the technoscientific infrastructure the country established in this period. Meanwhile, the Russian Space Agency (renamed Roscosmos in 1999) embarked on a series of privatisation measures that opened up new partnerships with NASA and US corporations.³⁸ As the ‘space age’ approached the 21st century, outer space – ‘the province of all mankind’ – swelled with the advanced infrastructures of globalised capitalism.

As far as the simmering NewSpace movement was concerned, the late 1980s and 1990s proved as disappointing as the Apollo cancellation. The commercialisation of LEO did little for the O’Neillian ‘humanising’ dream of large-scale permanent space settlement. David Chambers, CEO of the late 1990’s start-up MirCorp, remarked that the post-Apollo years were so disappointing that “it’s as though the Moon landing never happened” (in *Orphans of Apollo*, 2008). New organisations like the Space Frontier Foundation (founded 1988), Space Access Society (founded 1992) and the Foundation for the International Nongovernmental Development

³⁸ I discuss this, and the NewSpace privatisation of space station *Mir*, in Chapter 5.

of Space (founded in 1994, now defunct) were founded, while in 1987 the L-5 Society merged with the National Space Institute (founded by Werner von Braun) to become the National Space Society. NewSpace civil society groups continue to lobby for more a decentralised and deregulated spacefaring future.

Reagan-era commercialisation reforms had failed to surpass the achievements of the centrally coordinated Apollo Program. Yet NewSpace discourse increasingly deployed an anti-‘big government’ narrative that attacked NASA more frequently than the corporations it was tasked by Reagan to rely upon. NewSpace advocate Rick Tumlinson testified before Congress and asserted that:

“NASA and its parasitic contractors must no longer be allowed to manage the designing, building and operation of what are essentially glorified government space trucks/vans. Can you imagine if the government had done the same thing with an airline? It is as if the [Federal Aviation Authority] owned our single national air carrier. With no real competition it would never get cheaper, better or more efficient...and no one would be able to afford to fly on it. That’s the socialist monopoly we have in space flight.” (Tumlinson 2003).

Describing the highly profitable arrangements between NASA and military-industrial contractors as a ‘socialist monopoly’ is an interesting assessment. Tumlinson played a leading role in MirCorp’s 1999-2000 attempt to privatise the space station *Mir* (built by an actual socialist government, the Soviet Union), and NASA and ‘big aerospace’ were of course at the forefront of the space race between capitalist US and socialist Russia. Jeffrey Manber (also of MirCorp) describes the situation at NASA during the 1990’s and early 2000’s in similar terms: “if you wanted to work with the capitalists in space, you had to work with the Russians. If you wanted to work with the socialists, you work for NASA” (in Johnson 2015).

This equating of the big aerospace lobby with ‘socialist monopoly’ raises some interesting questions around neoliberalism and concentrated corporate power. *Corporate* monopoly (or oligopoly, more accurately) is arguably institutionalised in the American space industry. The American space economy was a legacy of the WW2 wartime economy: the key firms that supplied aircraft to the government during the war pivoted towards the newly coined ‘space industry’ (Bromberg 1999, p.20). Over the ensuing half-century, ‘big aerospace’ exhibited

a consistent pattern of corporate mergers and acquisitions. Today, Boeing³⁹, Lockheed Martin⁴⁰ and Orbital ATK⁴¹ have only SpaceX as a notable competitor in the provision of launch services (the most lucrative and high-risk of space industries). In 2006, Boeing and Lockheed Martin merged their space divisions to form the United Launch Alliance, further concentrating monopoly power in the supply of launch services to NASA and the US armed forces (a merger unsuccessfully challenged by SpaceX under antitrust law between 2005-6). In 2018, Orbital ATK was acquired by arms manufacturer Northrop Grumman.

Are there parallels between neoliberal thought and NewSpace anti-statism, regarding the acceptability of concentrated corporate power? Some of the earliest projects undertaken by Chicago School neoliberals sought to justify corporate monopoly, notably the Anti-Trust Project (1953-1957). Rob van Horn describes how Chicago economist Henry Simons had championed the classical liberal view that critiqued corporate monopoly (alongside trade unions and excessive state interventionism) as “inherently inimical to democracy because ... it undermined a necessary condition for democratic politics to flourish” (2009, p.204). Following Simons’ death in 1946 and publications from Aaron Director, Chicago school neoliberalism began to reconsider monopoly in light of the belief that the “corroding influence of competition” could “destroy all types of monopoly”, provided government intervention was limited (Director, cited in Van Horn 2009, p.218).

In making his ‘socialist monopoly’ remark, Tumlinson initially appears to adopt the classic liberal position advocated by Simons, that corporate monopoly has created barriers to entry, concentrated power and thereby undermines competition. However, contemporary NewSpace appears to have an expedient relationship with some of the aerospace monopolies.⁴²

³⁹ Founded in 1916, Boeing bought Rockwell Aerospace and Defense (itself a merger with North American Aviation) and merged with McDonnell Douglas between 1996-7 (Bromberg 1999, p.12-13).

⁴⁰ Founded in 1926, Lockheed Aircraft had competed with Martin Marietta (itself a 1961 merger between the Glenn L. Martin Co and American Marietta, which purchased General Electric’s Aerospace division in 1993) until merging with them in 1994 (Bromberg 1999, p.12-13).

⁴¹ Founded in 1928, industrial chemical manufacturers Thiokol Chemical bought Reaction Motors in 1958 (founded by members of early ‘pro-space’ organisation, the American Rocket Society) and won numerous contracts for supply of solid-fuel rocket motors (most notably for the Boeing-Air Force designed Minuteman ICBM). Alliant Techsystems – a publicly-traded spinoff from Honeywell – purchased Thiokol in 2001 to form ATK Launch Systems (Bromberg 1999, p.12-13). In 2015, Orbital ATK was formed through this company’s merger with the Orbital Sciences Corporation (founded 1982 and supplier of numerous spacecraft for NASA, the US military and commercial enterprise since).

⁴² The start-up Made In Space, ‘incubated’ by Silicon Valley’s Singularity University (co-founded by Planetary Resources’ Diamandis), is a further example of collaboration between NewSpace and big aerospace. In partnership

The space mining start-up Deep Space Industries (DSI) co-founded by Tumlinson is one example. The DSI investor prospectus tells potential investors about how the Lockheed-Boeing partnership of United Launch Alliance has offered to become a customer for propellant mined and refined off-world (Deep Space Industries 2016, p.3; see also Sowers 2017, p.3). Space mining's relationships with capitalist oligopoly are evident elsewhere. The Google and PayPal near-monopolies were founded by Larry Page and Peter Thiel, respectively; these early supporters of Planetary Resources were able to provide seed capital precisely because of their ICT oligopolies. Jeff Bezos' Blue Origin is funded by his personal wealth, derived from Amazon's global e-commerce near-monopoly. In spite of the NewSpace prerogatives of 'decentralised' spacefaring, concentrated corporate power looms as the more plausible means of actually realising privately-operated space mining operations. As with the Chicago School's stance on monopoly, NewSpace's activities (as opposed to its rhetoric) suggest they consider the concentration of corporate power as "not deleterious to the operation of the market" and the power of aerospace oligopolies to be "attributable to ill-functioning ham-fisted activities of government" (Van Horn 2009, p.229).

When NewSpace emphasises government as the cause of the 'big aerospace' monopoly problem, they appear to adopt the principles of 'public choice theory'. Public choice theory was developed by MPS economists James Buchanan and Gordon Tullock (1962), and it attempts to explain the behaviour of public officials using the neoclassical economic axiom of the self-interested, utility-maximising consumer. Karen Fischer summarises public choice theory as a theory of 'government failure': policy decisions are made by politicians "based on their interest in maintaining their positions of power" (2009, p.324). NewSpace actors have characterised American space bureaucracy as a "plethora of regulatory agencies whose officials do not even pretend to have been elected by anyone" (Zubrin 1994). NewSpacers have charged the centralised decision-making of NASA with a bias towards existing contractors (Boeing, Lockheed-Martin and so on), and have pointed to costly, long-run programs like the Space Shuttle or the (still ongoing) Space Launch System as evidence of "industrial base protectionism and pork-barreling" (Sarsfield 2002, p.31). Two writers from the Atlas Network's TechFreedom

with arms and aerospace giant Northrup Grumman, Made In Space is developing microgravity 3-D printing technologies for the Archinaut project, which will attempt construction of large, complex structures in space (Made In Space 2019).

recently implored Congress to reduce ‘opaqueness’ in NASA mission authorisation and lamented that “bureaucrats can still pick winners and losers with impunity” (Dunstan & Szoka 2017, p.8). According to NewSpace, this short-termism from elected officials reduces the opportunities for the burgeoning entrepreneurial sector – unless, of course, you are one of the ‘winners’ that receives multi-million dollar research grants (see, for example, Deep Space Industries 2019a).

In NewSpace discourse, these anti-monopoly and public choice arguments serve to perpetuate the O’Neillian angst about the US Government’s failure to adopt the long-term utopian vision of human settlement. NASA has retained an interest in mining the high frontier since the 1970s, but this has not progressed beyond scoping studies. NASA published a series of *Space Resources* reports, which did not represent “any Government-authorized view or official NASA policy” and were similar in nature to the ‘blue sky’ workshops that O’Neill had organised NASA’s Ames Centre in Silicon Valley at the peak of his popularity (McKay, McKay & Duke 1992, p.vi). The reports proposed mining techniques and hypothesised economic considerations, but the concepts they discussed were never given the multibillion-dollar investments needed for their fruition. NewSpace ‘pop science’ texts emerged in the 1990s, including some that touted multitrillion-dollar rewards for space miners. In *Mining the Sky*, John Lewis (now Chief Scientist with DSI) made exorbitant claims that asteroid mining could produce wealth “equivalent to the gross product of Earth for the next thirty thousand years” (1997, p.112).

NASA and American space policy had more modest goals, such as Space Shuttle missions to the Hubble telescope or the *International Space Station* (1998-present). Mars expedition plans came and went under the governments of George Bush, Bill Clinton and George W. Bush. The Obama Administration had established the 2009-10 *Review of U.S. Human Spaceflight Plans Committee* (the Augustine Commission), which briefly discussed *in situ* resource utilisation and off-world propellant production; the report noted that “their application appears to be far off” and “the technology remains to be demonstrated under realistic circumstances” (Review of Human Spaceflight Plans Committee 2010, p.101-2). NASA’s Asteroid Retrieval Mission was cancelled before its scheduled launch in 2021. NewSpace complaints about government-led spacefaring have been exacerbated by the perception that the US has been losing ground to foreign competitors. When the Space Shuttle was retired in 2011, the United States no longer had its own means of sending astronauts into space. Until SpaceX’s transportation of US astronauts to the ISS in 2020, the only way for American astronauts to reach

the International Space Station (ISS) has been NASA procurements of rides in Russian *Soyuz* capsules.⁴³ For the more patriotic members of NewSpace, NASA and the broader American space industry, this reliance on Russia represents a notable downturn in national prestige.

NewSpace civil society groups continued their advocacy work during this period of change in the international spacefaring landscape. In addition to the Space Frontier Foundation, National Space Society and Students for the Exploration and Development of Space, further examples from the contemporary US NewSpace network include: the Lifeboat Foundation, Tea Party in Space, the Space Development Foundation and Commercial Spaceflight Federation. The above groups (and more) comprise the Alliance for Space Development (ASD), united in advocating for “policies that will expedite the growth of the commercial space industry” (Wainscott 2017). The Alliance conducts an annual event on Capitol Hill in which volunteers meet with Congressional staff to discuss their *Citizens’ Space Agenda* (ASD 2016; ASD 2019). The ASD continue to advocate for ‘public-private partnerships’ that resemble Hayek’s planned construction of competitive market orders, urging the US Government to support space resources industries, commercial space stations and NASA’s existing commercial transport programs (ASD 2016).⁴⁴

Since the late 1990s, NewSpace has been supported by an increasing number of entrepreneurs and venture capitalists. As a culmination of Reaganite commercialisation reforms and a new commercial agenda under George W. Bush (2001-2009), including the *Commercial Space Launch Amendments Act* (2004), new actors were drawn into smaller space projects. Venture capital (VC) funds, asset managers and private ‘angel investors’ saw potential in space investments. The Space Angels Network (2007-present) is a VC fund pooling the resources of private investors. The Space Angels repeat the NewSpace refrain that their project is more than ‘just business’ and align it with ‘socially responsible investment’:

⁴³ SpaceX’s recent success can be attributed to the political need to use American space systems capable of transporting crew off-world. While SpaceX was established by the personal wealth of Elon Musk, the company relies upon NASA procurements – such as its \$2.6 billion contract for the Commercial Crew Program (Bolden 2014). Musk, figurehead of the NewSpace era, is an exemplary case in the ongoing entwinement of private profit and public money in the space industry.

⁴⁴ In chapter 6, we will explore ‘NewSpace eschatology’ and the role of off-world commerce in averting planetary catastrophe in more detail. Here, it is worth noting that the ASD and other NewSpace actors (such as MirCorp’s Walt Anderson) have also advocated for planetary defences in the form of monitoring near-Earth objects (NEOs), like asteroids. Recent endorsement of NASA’s NEOCam telescope is one example (ASD 2019, p.7).

“We recognize that investing can sometimes feel meaningless. There’s some part of you that wants your efforts to affect real change—you want to have more impact, leave a legacy; maybe even find a sense of purpose in your investments.... Entrepreneurial space may seem outside the realm of traditional impact investing, but there’s no denying that many of our members find space investing to be aspirationally fulfilling” (Space Angels 2019).

Lerner, Leamon and Speen analysed the role of VC in low-Earth orbit (LEO) enterprises, noting a total of US \$1.64 billion of venture capital invested in LEO-operating firms between 1983-2015 (2016, p.90).

Several space mining firms have been established since 2010. Table 1 (overleaf) describes the most prominent space mining start-ups and lists a selection of their investors. While they have attracted investment from numerous quarters, we can attribute their emergence to entrepreneurs within the NewSpace network – such as O’Neill enthusiasts like Tumlinson (DSI), Peter Diamandis (Planetary Resources) and Bob Richards (Moon Express). These firms have been supported by venture capital or angel investment, including numerous Silicon Valley billionaires. However, this start-up industry also relies upon the ongoing support of the taxpayer, in the form of research grants, NASA procurements and – in the case of Planetary Resources – a €25 million investment from the Luxembourg Government.⁴⁵ In spite of DSI CEO David Gump’s claim that his company is “the working class asteroid mining company” (Gump 2018), the combination of government support and venture capital suggest that the nascent space mining sector is very much an elite endeavour.

⁴⁵ I will discuss government supports of the space mining industry further in section 2.2.

Table 1: Notable investors in space mining firms and select affiliations

	Planetary Resources	Moon Express	Deep Space Industries	iSpace Technologies⁴⁶
Head offices	Redmond, WA and Luxembourg	Cape Canaveral, FL	Moffett Field, CA and Luxembourg	Tokyo, Luxembourg and Moffett Field, CA
Government investment	Société Nationale de Crédit et d'Investissement (Luxembourg public investment bank)			Innovation Network Corporation of Japan (Gov)
Venture capital and asset managers	Founders Fund (VC) OS Fund (VC) Sinovation Ventures (China VC) Tencent Holdings (China ICT conglom)	Founders Fund (VC) Minerva Capital Group (VC) Collaborative Fund (VC) Tencent Holdings (China ICT conglom)	Space Angels Network (VC) Metatron Global (VC) Light Speed Innovations Technoport	Tokyo Broadcasting System (Asset mgmt) Sparx Group (VC) Konica Minolta Development Bank of Japan
Angel investors & private contributors	Larry Page, Eric Schmidt (Google) Charles Simonyi (Microsoft) Richard Branson	Barney Pell (entrepreneur) Naveen Jain (entrepreneur) Rob Nail (Singularity University)	Eric Uhrhane (angel invest.) Richard Treitel	Real Tech Fund Japan Airlines
Funding:	\$50.3M	\$65.5M	\$3.5 - 18M	\$92.3M

Sources: Bradford Space Inc. (n.d.); Crunchbase (2019a, 2019c, 2019c & 2019d); iSpace (n.d.); Planetary Resources (n.d.-a; 2016a); Pepis, Evans & de Jong (2018). This list is not exhaustive.

⁴⁶ With my focus on the emergence of the CSLCA and the significance of this particular law, I have paid less attention to potential space resource appropriations that could originate in other quarters – Japan’s iSpace start-up being a notable example. iSpace staff and founders may or may not have similar ideological motivations to those of US space mining firms; there are institutional similarities in the company’s Luxembourg’s offices and support from public investors. However, detailed analysis of the firm and the prospect of Japanese space resource laws are outside the scope of this dissertation.

1.3.3 NewSpace, Atlas and private property rights for space resources

The proliferation of NewSpace enterprises and space mining start-ups in the past two decades has been endorsed by the think-tanks of the Atlas Network. The Cato Institute is a key node in Atlas neoliberalism and Edward Hudgins (a former Heritage and Cato writer and now Director of Research with another Atlas bastion, the Heartland Institute) has published numerous recommendations in support of private property law for outer space (Hudgins 1998; 2001; 2002; 2006). The venture capitalist Peter Thiel is a high-profile Atlas affiliate, having written for the Cato Institute (Thiel 2009) and established the Atlas member Seasteading Institute. Through his Founders Fund, he has a material interest in space miners Planetary Resources and Moon Express. Atlas members have taken notice of the space mining industry, and they directly and indirectly supported the passage of the *Commercial Space Launch Competitiveness Act* (CSLCA 2015). Following the apparent Heritage role in the UNCLOS-*Moon Agreement* episode, this represents a second case study where Atlas neoliberals can be seen as participants in the commodification of off-world mineral resources.

My impression is that many NewSpace advocates have arrived at neoliberal prescriptions for a state-backed space economy largely through their disappointment with the lack of progress on crewed missions beyond the Moon – as opposed to concerted engagement with neoliberal theorists. The Cato Institute’s Edward Hudgins, however, explicitly draws on Chicago School theorists in advocating for a neoliberal constitution for future space colonies.

“To utilize fully the resources of Mars, humans will need to bring to that planet more than machines, tools and scientific instruments. They will need to bring law. Not too much law. Most of the economic, political and social problems on earth result from an overabundance of rules, regulations and restrictions on individual liberty. Thus to fully exploit Mars' potential and to make it another home for the human race, an economic-political system will have to emerge that allows individuals or voluntary associations of individuals to secure exclusive rights to use resources and to exchange freely with others, and that protects property, and enforces contracts” (Hudgins 1998).

In Hudgins’ Martian law, regulation and coercion should be limited to enforcing individuals’ and consortia’s rights to private property and contractual exchange – a view espoused by neoliberals like Lippman (1938) and Ronald Coase (1960). He continues by drawing on the efficient market hypothesis, that “even with initial mal-distributions of wealth, as long as the free exchange system exists, economic efficiency will win out. That's why establishing

markets will be crucial to Martian settlement” (Hudgins 1998). Explicitly invoking Hayek’s spontaneous order, he rejects the alleged “belief among socialists and statisticians that all-wise, caring bureaucrats can plan and benevolently guide economies to prosperity” – instead trusting that anti-statist free marketeers could benevolently maintain a functioning off-world society (Hudgins 1998).

Hudgins is a key link in mapping NewSpace onto the MPS-Atlas Network. His most significant contribution to neoliberal space advocacy is his compilation of the Cato Institute’s *Space: The Free Market Frontier* (Hudgins 2002). This volume resulted from a conference Cato held in partnership with, among others, “our friends at the Space Frontier Foundation” (ibid, p.v).⁴⁷ In Hudgins’ volume, space lawyer and advocate James Dunstan offers an example of neoliberal opposition to common property, describing the *Outer Space Treaty* as representing “the high-water mark of international socialism in its concept that outer space is the province of all humankind” (Dunstan 2002, p.235). Hudgins and the Cato Institute have elsewhere supported privatising space infrastructure, reducing the role of government in spacefaring to a purchaser of private sector goods and services and the legislating for private property rights legislation for space resources (Crawford 1986; Scheraga 1987; Hudgins 2001; Salter & Leeson 2014).

Establishing more concrete causal relationships between NewSpace and Atlas networks requires more investigation. Nonetheless, we can see NewSpace actors espousing neoliberal-style policies long after publishing with the Cato Institute (e.g. Muncy, Tumlinson & Werb 2002; Tumlinson 2012). One author from Cato’s *Free Market Frontier* report now works with a new Atlas organisation – TechFreedom – that has recently testified before Congress in favour of domestic space resources law (Dunstan 2002; Szoka & Dunstan 2017). There are also numerous instances where NewSpace-like discourse emanates from Atlas think-tanks, perhaps suggesting that NewSpace communication has been influential in this ‘mainstream’ of neoliberal advocacy, or auguring future entanglements between the two movements. In addition to Cato and Heritage, the Competitive Enterprise Institute, Niskanen Centre, Atlas Society, Foundation for Economic Education (FEE), Mises Institute, Reason Foundation and TechFreedom can all be seen supporting off-world private property or the privatisation of NASA (respectively: Simberg 2012; Hampson 2017; Hudgins 2006; Block &

⁴⁷ The volume features papers covering the scope of the NewSpace network: a pro-private property rights lawyer (White 2002); venture capitalists (Higginbotham 2002); NewSpace civil society advocates (Muncy, Tumlinson & Werb 2002); think-tank professionals, including RAND Corp’s Liam Sarsfield (2002); a pro-NewSpace Congressman (Rohrabacher 2002); and former Apollo astronaut Buzz Aldrin (Aldrin & Jones 2002).

Huebert 2008; Murphy 2005; Bennett & Grearson 2019; Szoka & Dunstan 2017). All of these organisations have a social and ideological lineage tracing back to the Mont Pèlerin Society, and we will return to these some of these texts throughout the dissertation.

In light of NewSpace’s environmentalist claims, it is important to emphasise here that nearly all of these Atlas organisations have mounted sustained attacks on either climate science, climate scientists, environmental protection law and anything that contradicts the dogma that “the free market [will] outperform government intervention, regardless of the fragility of Earth’s ecosystems” (Callahan 2007).⁴⁸ Through Atlas, NewSpace’s post-limits environmentalism becomes bedfellows with neoliberal strategies of climate denial. NewSpace advocacy for the profit-based colonisation of space – a project that began with the O’Neillian rejection of limits to growth and the global environmental governance that came with it – is being amplified by organisations that have opposed action on climate change. In light of NewSpace’s evident support from neoliberal think-tanks and the willingness of NewSpace actors to collaborate with these organisations in the past, we need to treat the rhetoric surrounding space mining – such as Planetary Resources’ claim that “we can use the resources of space to save our planet” (Orsulak 2018) – with a degree of scepticism.

However, there are two key differences between NewSpace and neoliberal positions on climate change. First, NewSpace’s colonisation project involves a bypassing of Earth’s biophysical limits. From O’Neill to the SFF to Elon Musk, most NewSpace members do not deny these limits. Second, Atlas engagement with NewSpace has for the most part been limited to the broadcast of NewSpace discourse through the communication channels of Atlas think-tanks (white papers, blog posts, seminars and so on). I have not found evidence of lobbying for the CSLCA from the Atlas Network in the form of financial support for campaign contributions or political action committees. This is a point of contrast with the coordinated assault on climate policy conducted by Atlas organisations and their billionaire donors like the Koch Brothers and ExxonMobil (ExxonSecrets n.d.). NewSpace’s ‘March Storm’ on Capitol Hill does feature an organisation called the Tea Party in Space. However, unlike the fiscal conservative Tea Party movement spearheaded by Sarah Palin and bankrolled by the Kochs’ Americans for Prosperity think-tank (Mirowski 2013), there is no evidence that NewSpace civil society groups are ‘astroturf’ organisations in receipt of funding from powerful Atlas donors. Neither the Space Frontier Foundation (SFF) nor

⁴⁸ The Niskanen Center is the notable exception to Atlas’ climate denialism, having been formed by former Cato writers who objected to the Koch brothers’ takeover of the Cato board and its persistent climate denialism (Gunther 2017).

National Space Society (formerly the L-5 Society), for instance, are Atlas member organisations.

In Republican donor Peter Thiel, however, there are early signs that the NewSpace and Atlas networks are converging on a more material level. Prior to advent of cryptocurrency, Thiel co-founded the PayPal money transfer system 1998 with a vision of “a new world currency, free from all government control and dilution — the end of monetary sovereignty, as it were” (Thiel 2009). The sale of PayPal to eBay for \$1.5billion in 2002 expanded the personal fortunes of Thiel and Elon Musk (whose X.com merged with PayPal in 2000). While Musk turned his attention to SpaceX, Thiel backed numerous start-ups and corporations through his Clarium Capital hedge fund and venture capital Founders Fund (including SpaceX). Thiel’s Founders Fund is an investor in space miners Planetary Resources (Planetary Resources n.d.-a) and Moon Express (CrunchBase 2019b).

Through the Thiel-Founders Fund investment in these companies, we can see a material interest from an Atlas member in the passage of the CSLCA. In 2015, Thiel was awarded the Hayek Lifetime Achievement award by the Austrian Economics Center and F.A. v Hayek Institut (Atlas members organisations) in “recognition of his entrepreneurial contributions to the world economy...as a staunch advocate for free markets and innovation” (AEC 2015). In an article for *Cato Unbound*, Thiel goes beyond the anarcho-libertarian off-worlding of O’Neill into a Hayekian contempt for democracy:

“I no longer believe that freedom and democracy are compatible... the great task for libertarians is to find an escape from politics in all its forms — from the totalitarian and fundamentalist catastrophes to the unthinking demos that guides so-called ‘social democracy’” (2009).

In pursuing the Hayekian immunisation of economy from democracy and the ‘escape from politics’, Thiel has contributed funding to a number of civil society groups that further techno-libertarian causes closer to Earth. This includes the Machine Intelligence Research Institute, which seeks to augment the human condition through innovations in artificial intelligence and cybernetics, and the Seasteading Institute, which seeks to build offshore island utopias in international waters. Headed by Patri Friedman, grandson of MPS co-founder and neoliberal economist Milton Friedman, the Seasteading Institute is a member organisation of the Atlas Network. Thiel is both a noted Trump supporter and a fan of the anarcho-capitalist text *The Sovereign Individual* (Davidson & Rees-Mogg 1999; O’Connell 2018). O’Connell notes how *The Sovereign Individual*’s description of an apocalyptic future

resonated with Thiel; the text predicts that the state will become obsolete through cryptocurrencies and “out of this wreckage will emerge a new global dispensation, in which a ‘cognitive elite’ will rise to power...and will redesign governments to suit their ends” (O’Connell 2018). As an opponent of climate action, Thiel may play an active role in bringing an apocalypse about; coincidentally his latest escape hatch is a doomsday bunker in New Zealand (O’Connell 2018).

The involvement of an Atlas neoliberal in two space mining firms might foreshadow an off-world plutocracy, drastically at odds with the provisions of the *Outer Space Treaty* and indeed humanity’s common interests in global commons. Some further evidence of Atlas involvement in the CSLCA’s passage can be found through Rep. Dana Rohrabacher (R. CA; 1989-2018). Rohrabacher was a contributor in Cato’s *Space – The Free Market Frontier*, arguing that space corporations should be regulated on a ‘zero gravity, zero tax’ basis (Rohrabacher 2002). Rohrabacher has more recently supported the NewSpace civil society partnership, the Alliance for Space Development (ASD 2016). He introduced the unsuccessful *Space, Exploration, Settlement and Development Act* (2016), which would have amended the *NASA Act of 1958* to prioritise “the exploration and development of space leading to human settlements beyond Earth” and “enable America to tap vast new resources” (SEDS 2016, s.2; ASD 2016). In May 2015, he lauded pro-commerce legislative reform in the House in the lead-up to the passage of the CSLCA (in Cong. Rec. 2015b, H3517), and was a frequent co-sponsor of domestic off-world private property law. Through Rohrabacher and Thiel’s investment in Planetary Resources, the Atlas-MPS network has played a role in introducing the unilateral assertion of private property rights for US corporations in outer space.

Focusing solely on Atlas neoliberalism perhaps overcomplicates what is a well-trodden path in contemporary representative democracy. The United States’ unilateral guarantee of private property in outer space is a direct result of the lobbying conducted by Planetary Resources, who proudly note in their promotional material that they “successfully lobbied towards the passage of the U.S. Commercial Space Launch Competitiveness Act” (Planetary Resources n.d.-b). The company hired a legal advisor to draft the CSLCA precursor and it paid a lobbying firm that hired former Congressmen to directly lobby sitting politicians (Gabrynowicz, in Levine 2015; Edwards, in Cong. Rec. 2015, p.H3520). This I discuss in Chapter 3. It is also worth noting that, much like the initial role played by aircraft manufacturers in the establishment of NASA, the CSLCA enshrines industry input into government policy by mandating consideration of “observations, findings, and

recommendations from the Commercial Space Transportation Advisory Committee” (CSLCA 2015, s.111). In this light, plutocratic power is being cultivated on the space frontier through the support of supposedly democratic institutions.

In 2017, Luxembourg became the second nation to introduce private property law for space resources (*Space Resources Act 2017*). To the techno-industrial and politico-legal power of the United States we can add Luxembourg, a low-tax jurisdiction that is one of the world’s primary centres of off-shore investment (Zucman 2015). At face value, Luxembourg is leveraging its existing space industries and associated infrastructures (concentrated in satellite construction and operation) to attract the potentially lucrative space mining industry. Through the *SpaceResources.lu* initiative, the small constitutional monarchy has made investments in and established memoranda of understanding with American space mining firms, while several have established offices in Luxembourg City (Table 1, above). As an ally of transnational capital, space miners’ engagement with the country’s space resources initiative can be read as an effort to ‘multi-lateralise’ and reframe the US-led private property drive as a “global endeavour”, while still having future property claims anchored in the state authority of the US (Marquez 2017, p.4).

On the other hand, Luxembourg has persistently structured its economic policy in order to help multinational corporations avoid their domestic tax responsibilities (Zucman 2015). Here we can see an accord between NewSpace discourses of escape and disavowal of responsibility to society (in the form of preserving commons, paying tax and sharing resource revenue) and these partnerships with Luxembourg. This does not imply that space mining firms are guilty of financial crimes (though, in Chapter 5, we will explore the proto-NewSpace investor Walt Anderson, who holds one of America’s largest tax fraud convictions). However, given that the Luxembourg Government touts its “attractive corporate tax rate” and “extensive network of double tax treaties” to foreign companies looking to relocate (Luxinnovation 2017, p.7), it is not unreasonable to hypothesise that the O’Neillian ‘humanising’ dream is being supported by an escape from domestic, democratic tax obligations.

According to NewSpace advocate Rick Tumlinson, commercial space colonialism affords the opportunity to escape “the heavy hand of global Big Brother” (Tumlinson 2003). Given the interest of men like Thiel and Google’s Larry Page (both Planetary Resources investors) in the space mining industry, the allusion to Orwell was prescient. Thiel’s Palantir Technologies has developed software for ‘big data’ analytics that is used across the United States Intelligence Community. Thiel’s business has profited significantly from state

surveillance programs, fortifying the sovereign power of the US rather than ‘escaping from world politics’, as he called it. Google, similarly, received a significant leg-up from government security initiatives – its search engine was developed with the support of “the intelligence community” in order to “find ways to track individuals and groups online” (Nesbit 2017). It remains to be seen precisely what role space mining firms will play if and when the ‘strong state, free economy’ relationship actually materialises on celestial bodies. Regardless, the strengthening ties between agents of neoliberalism and NewSpace strongly suggest that any freedoms of the space frontier will be exercised by an elite few.

1.4 Conclusion

We have reached the end of the long road from Konstantin Tsiolkovsky’s dreams of off-world freedom to the introduction of private property laws that may undergird NewSpace’s neoliberal space utopia. For many NewSpace actors, there remains an evident sense of disappointment in how space exploration has transpired since the end of Apollo. Gerard O’Neill’s *High Frontier* endures as a compelling alternative to the more modest spacefaring activities undertaken by NASA since the 1970s. NewSpace ventures are now being supported by the burgeoning wealth of Silicon Valley and venture capitalism. Goldman Sachs are no strangers to speculative investment, and they have taken notice of space mining:

“Space mining could be more realistic than perceived...According to a 2012 Reuters interview with Planetary Resources, a single asteroid the size of a football field could contain \$US25bn- \$US50bn worth of platinum... We expect that systems could be built for less than that given trends in the cost of manufacturing spacecraft and improvements in technology. Given the capex of mining operations on Earth, we think that financing a space mission is not outside the realm of possibility” (cited in Edwards 2017).

Start-ups like Planetary Resources represent the comparatively sober ‘business face’ of an emancipatory, transcendent and cornucopian imaginary with roots as deep as the cosmist philosophy of Tsiolkovsky. Yet the ‘visioneering’ (McCray 2013) of the NewSpace imaginary is now predicated on the accumulation of private wealth; these two elements in NewSpace utopianism will continue to sit uneasily so long as off-world resource appropriation is part of the space colonisation agenda.

NewSpace desires “an escape from politics” (Thiel 2009), an escape from the *demos* largely uninterested in their off-world colonial imaginary. Yet despite NewSpace’s continuing valorisation of the entrepreneur and their rejection of state control of the space economy, their libertarian free enterprise dream ultimately needs the strong state to open and enforce its conditions of existence. In the words of the Mont Pèlerin Society, the supposedly “diffused power and initiative” of “private property and the competitive market” actually requires “fostering” through “the rule of law” (MPS n.d.). The NewSpace utopia is now supported by private property rights. For the very first time in human history, the legal groundwork has been laid for private ownership claims on other celestial bodies. It is a momentous step in humanity’s relationship with the cosmos. Far from ‘opening’ the space frontier, it is likely to enclose it.

2. Enclosing the space commons? Theorising off-world property

In the previous chapter, we explored an ascendant neoliberal strain in NewSpace political ideology, in which post-limits techno-optimism coalesces with an aversion to democratic accountability and a rejection of common property. NewSpace began with space enthusiasts' excitement about O'Neill's colonisation imaginary. As we approach the present day, the NewSpace network becomes increasingly confluent with the neoliberal Atlas Network, culminating in the private property provisions of the *Commercial Space Launch Competitiveness Act of 2015* (CSLCA). NewSpace cosmopolitics imagines the entwined colonisation and commodification of the celestial bodies of our Solar System, a utopian project that envisions space as a frontier of commercial exploitation, individual liberty and limitless expansion.

The NewSpace utopia differs markedly from one of the most influential utopian texts that emerged from early modern capitalism. The term 'utopia' originated in the satirical political text by the lawyer and philosopher, Thomas More (1478-1535), which was published during the transition from feudal to capitalist relationships between people, land and law. More's *Utopia* (2005 [1551]) describes the sweeping political and social transformations that began in England in the late 15th century. He wrote during the first wave of enclosure laws, in which the common lands that provided living space and sustenance for villagers, peasant labourers and the rural poor were gradually and violently converted into land privately-owned by wealthy barons, feudal lords and noblemen. More's critique of the Enclosure laws pointed to the catastrophic social dislocation that they wrought:

“‘But I do not think that this necessity of stealing arises only from [idle men in times of peace]; there is another cause of it, more peculiar to England.’ ‘What is that?’ said the Cardinal: ‘The increase of pasture,’ said I, ‘by which your sheep, which are naturally mild, and easily kept in order, may be said now to devour men and unpeople, not only villages, but towns; for wherever it is found that the sheep of any soil yield a softer and richer wool than ordinary, there the nobility and gentry, and even those holy men...not contented with the old rents which their farms yielded, nor thinking it enough that they, living at their ease, do no good to the public, resolve to do it hurt instead of good’” (More 2005, p.12).

Peasants were forced off common lands and were pushed towards proletarianisation through the criminalisation of vagabondage and pulled towards urban wage labour (Polanyi 2001, p.109). This was authorised and legitimised through the formalisation of private ownership

under English common law and the extension of sovereign jurisdiction. Traditional forms of land tenure, notably the mutual obligation between feudal lords and peasants, were upended in order to take advantage of commercial opportunities (particularly wool exports to continental textile manufactures) in international trade (Marx 2015 [1887], p.510). In positing a more just form of social organisation, More described a fictional island where there was no private property and socially-essential resources were allocated according to need, in an economy of communal work and the renunciation of greed and competition. Drawing on the Greek term, *utopos* – from *ou* (‘not’) and *topos* (‘place’), or ‘nowhere’ – he named this idyll ‘Utopia’.

Is the NewSpace utopia predicated on an enclosure of the Solar System? What parallels can we draw between the legal guarantee of private property ownership proposed under the CSLCA and the waves of enclosure that have transformed the Earth? Politico-legal enclosures did not of course terminate with the final wave of English *Enclosure Acts* (1845-1882). Commons scholar and activist David Bollier describes contemporary enclosures such as the conversion of developing nations’ grazing lands and water supplies into the private property of foreign multinational corporations (2002). Enclosure has also included the commodification of less tangible or visible commons, such as academic knowledge ‘paywalled’ by oligopolistic publishing houses or genetic material patented by multinational behemoths of agribusiness or biotechnology (Bollier 2002; Bollier & Watts 2002). My analysis in this chapter leans more towards the material or spatial forms of common property. In this sense, the celestial bodies of the Solar System are the last commons to be subject to some form of enclosure.

NewSpace promises an ‘opening up’ of the space frontier, yet the pre-emptive legalisation of private appropriation of hitherto common resources points us toward an alternate space future. Assigning private property rights on a first-come, first-served basis would most likely restrict the use of celestial bodies to those with the technical and economic capacity to reach them. Freeland (2017) raises, in hypothetical terms, the possibility that off-world mining could exploit an asteroid to the point of its non-existence – thereby representing an appropriation of a celestial body in its entirety. The right to be free from ‘harmful interference’ may also herald the effective enclosure of parts of celestial bodies. In international space law, this term has been understood to mean that when a nation or private operator exercises their right to freely explore and use outer space as per the OST (1967, Art.1), they are obligated to “avoid harmful interference with other spacecraft” (Masson-Zwaan & Palkovitz 2017, p.8). Consistent with the *Outer Space Treaty* and other space law

instruments, such as the Constitution of the International Telecommunications Union, the CSLCA recognises the right of space miners to be free from “harmful interference” from other parties – much like satellite broadcasters have the right to be free from harmful radiocommunication interference from other satellite operators (CSLCA 2015, s.51302; OST 1967, Art.9; ITU 1992). Exercising this right – while still meeting one’s OST obligations to ensure other parties’ freedom of use and exploration – is problematised in the case of space mining (Perry 2017, pp.15-17). Tronchetti notes that, “if implemented, the Act could result in the establishment of exclusion/safety zones on the surface of an asteroid so as to protect the activities of US mining companies” (2015, p.8). The CSLCA could produce scenarios in which access and use of celestial bodies will be prevented for anyone who arrived later – first movers could establish semi-permanent mining infrastructure above a valuable mineral reserve on the Moon or Mars, and then exercise the right to be free of harmful interference. This would effectively ‘fence off’ or enclose surface areas of celestial bodies for the use of space mining firms – analogous to the claiming of ‘land’ – thereby limiting access for other parties and concentrating the benefits of exploitation in the hands of a small cohort of ‘all mankind’.⁴⁹

Yet NewSpace continues to describe potential self-sustaining missions to outer space as ‘opening’ the space frontier (e.g. Moon Express n.d.). They appeal to the romanticised (and whitewashed) history of pioneering, going ‘westward bound’ on the American frontier (e.g. Zubrin 1994). The NewSpace refrain is to “travel light and live off the land”, a peculiar analogy that downplays the sheer investment and technoscientific prowess needed for anything other than a terrestrial, Earthly existence (Zubrin 1996, p.xviii). Writers within the Atlas Network have also described off-world property in terms of settler colonialism, notably in the Competitive Enterprise Institute’s *Homesteading the Final Frontier* white paper (Simberg 2012). Interestingly, the word ‘colony’ derives from the Latin *colonia* (settled land, farm), *colonus* (husbandman, tenant farmer, settler) and *colere* (to cultivate, to inhabit) – to colonise or to settle implies human dependence upon land for subsistence (Harper 2019). The off-world private property laws of the US and Luxembourg pre-emptively extend

⁴⁹ While the CSLCA guarantees future private property claims over minerals rather than granting land title or tenure, NewSpace actors have previously argued in favour of more literal ‘enclosures’, such as the US Government offering land grants to prospective off-world colonists as a means of incentivising private sector settlements (e.g. Wasser & Jobes 2008). The National Space Society, for instance, argues that land grants off-Earth could eventually be “large enough to make feasible subdivision and resale” (2012, p.9). However, other writers have noted that state-endorsed land claims such as this would contravene the OST more overtly (Szoka & Dunstan 2015; Perry 2017).

fundamentally terrestrial concepts of property and sovereignty onto the extra-terrestrial frontier. Yet this is a frontier that *does not have land*, in the biological, life-supporting sense that it has been known for the entirety of human existence.

In this chapter we will consider the CSLCA and NewSpace's colonisation narrative within the wider literature of political and legal geography, in particular the grounding of private property rights in state sovereignty. My analysis in this chapter explores the origins of Anglo-American constitutional laws governing property in land more than it does property in minerals – the evolution of mining rights belongs to a different thread in political history. In the following chapter we will turn our focus to 'mineral sovereignty' and the close relationship between state sovereignty and private rights to extract from mineral commonwealths (Walker & Johnson 2018). However, it is worth noting here that the "nearly universal national ownership of minerals today" can be traced to the feudal system's vesting of "all property in the monarch or sovereign" (Flomenhoft 2018, p.16).

In exploring the nature and origins of common and private property in Anglo-American legal formalism, I will illustrate how the pre-emptive enclosure of celestial bodies both resonates with and challenges the common theoretical frames that scholars have used to approach private property and the political authority in which it is rooted. The CSLCA represents an exclusionary, individually held property entitlement that is supported by the national laws of a sovereign power. By treating outer space as a zone of free appropriation, NewSpace and the authors of the CSLCA appear to employ a Lockean 'natural law' description of private property as a self-evident, inalienable right. Thus, the libertarian property rights project of NewSpace takes us to the central paradox of private property theory – it is secured *by* government *against* government. In developing an approach to this apparent contradiction within NewSpace discourse, I draw on Karl Polanyi's *The Great Transformation* (2001 [1944]). This historical sociology of capitalism describes the emergence of 'free' markets as the result of continuous government intervention. Polanyi emphasised the role of political and legal institutions in the enclosure of common land, and his work is valuable for revealing the entwinement of sovereign and private appropriation that I argue is at the heart of the CSLCA-*Outer Space Treaty* debate.

As a way of framing the uniqueness of outer space as a site of political authority and private ownership, I will turn to the ancient Greek term *nomos* – meaning a spatial law or order predicated on the appropriation and division of land – as articulated by the controversial German jurist Carl Schmitt (2003; 2015). Schmitt elucidates the term *nomos* as part of his account of national and international law, arguing that legal orders and political power derive

from the “terrestrial fundament” of land appropriation, including the *dominium* of private property and the *imperium* of national sovereignty (Schmitt 2003, p.47). Schmitt’s excavation of *nomos* is valuable for framing the sheer unconventionality of the Solar System as a site of state sovereignty and property ownership. Outer space is still awaiting the constitutive act of appropriation. Schmitt and Polanyi both offer unavoidably terrestrial accounts of the *nomoi* of Earth and the deep human history of common property relationships. Yet perhaps the off-world is a literal utopia: with no land to colonise, it is a *utopos* or ‘no place’ (Carey 1999, p.1).

2.1 What is property?

Before we consider the novelty of space as a site of either private or common property ownership rights, we will begin with some basic definitional work – what exactly do we mean by ‘property’? The legal philosopher Jeremy Waldron aptly surmises that “more than most policy areas dealt with by political philosophers, the discussion of property is beset with definitional difficulties” (2016, p.2). A comprehensive chronology of common and private property arrangements in human history is outside the scope of this chapter. However, approaching the OST-CSLCA debate necessarily involves a discussion of Western, formalist understandings of land law. The questions raised by the NewSpace commercial-colonial project speak to deeper political history and lead us into the legal traditions of ancient Rome, early-capitalist England and post-revolutionary America. On whose authority can one party claim ownership of land to the exclusion of others? What is the moral, political or economic justification for private ownership of things once held in common? Why should private property ownership be conceived of as a fundamental human freedom?

2.1.1 *The deep history of common property*

Liberal capitalist economies are essentially predicated on the distinction between ‘mine’ and ‘yours’, lending private property rights a sense of ubiquity and self-evidence. If we looked for a *vox pop* definition of property, most people might arrive at something synonymous with ‘possession’: material objects claimed by individuals or groups of people, like dwellings, consumer goods and even immaterial objects like intellectual property. Throughout human history, the ‘chattel’ property claims of empowered social groups have also been authorised and legitimised through legal statute. Human and non-human life – animals, children, spouses, servants and slaves – can become an individual’s private property, and this is still evident in the 21st century.

Property is more than a simple claim by people over objects. It is more accurately described in terms of plural and often fluid relationships *between people in relation to things*. To use legal geographer Daniel Bromley’s words, capitalist private property relationships can be defined as “social relation[s] that [define] the property holder with respect to something of value (the benefit stream) against all others” (1991, p.2) – a claim to something made by one actor that excludes other actors. More than rights of possession, the entitlements of the CSLCA include ‘component rights’ of *jus utendi* (to use property), such as separating asteroidal water ice into hydrogen and oxygen, and *jus disponendi* (to dispose of property), such as transferring ownership rights over off-world minerals to another party through commercial exchange (Cohen 1927, p.12). They are rights claimed by the property-holder: in legal philosopher Morris Cohen’s words, “the essence of private property is always the right to exclude others” (Cohen 1927, p.12).⁵⁰ Off-world minerals would cease to be the common

⁵⁰ Whether we approach property from either a sociological or jurisprudential starting point, discussing private property rights necessarily involves a discussion of the ‘bundle of rights’ concept, a shorthand description of property relationships that originated with English jurist and legal historian Sir Henry Maine (2007 [1917]). Rights to own property commonly involve a set of privileges *and* duties or obligations, rather than unfettered and outright ownership. Owning real estate entails the right to own and sell a house, for instance, but owners are also required to register their ownership with a property registry, pay land tax, adhere to zoning laws and respect the rights of their tenants, among other responsibilities. As Waldron notes that it is “probably a mistake...to insist on any definition of private property that implies a proprietor has absolute control over his resources” (2016, p.6). As far as the CSLCA is concerned, these reciprocal rights are expressed through Title IV’s assurance that these rights would somehow be “in accordance with applicable law, including the international obligations of the United States” (CSLCA 2015, s.51303). These obligations refer, of course to the articles and principles of the OST – ensuring freedom of use for all State Parties (and their corporations), exploring and using space through peaceful means and maintaining other parties right to freedom from harmful interference, among others. Whether the individually held property rights of the CSLCA would (and could) be curtailed for the benefit of external parties (domestic or international), is the subject of much conjecture and is discussed further in Chapters 3 and 4.

property of ‘all mankind’ – as per the principles of the *Outer Space Treaty* (OST) – once they became privately owned and consumed by a space mining firm.

Outer space is currently declared a commons in international law: it is “free for exploration and use by all states...on a basis of equality...[and] free access”, and is not subject to national appropriation (OST 1967, Articles 1 & 2). The OST describes celestial bodies in terms increasingly absent in neoliberal capitalism. Common property also involves relationships between social agents that define rules about places and resources – this time predicated on non-exclusive rights assigned at a community level and defended by the community. Collective decision-making usually results in further codifications on what rights users have, sanctions that the community can impose on users for breaking the rules about using commons and even excluding some groups of people from using commons altogether (such as villagers in a rival town). Elinor Ostrom’s (1990; 2012) empirical research outlined the great diversity in ‘common pool resource’ management schemes across the world, and described multi-scalar decision-making units (states, markets and community-levels of authority, and combinations of these). All members of a township might have access to a neighbouring pasture to feed their animals or a waterway for fishing, and communal rules might establish limits for the permissible number of grazing animals or the size of a fish catch. These rights sometimes involve principles of open, unrestricted access and these rights are often allocated to much broader, diffuse communities. This is particularly true in the era of UN treaty law and the institutional shift towards international governance, such as rights for states and corporations to access and use global commons like the high seas or outer space.

Contrary to the normalisation of private property that is evident in NewSpace or neoliberal discourse (e.g. Simberg 2012; ASD 2019, p.3), common property is a social institution that pre-dates market capitalism by many millennia. Private property in land is only as old as capitalism, an approximately 400-year blip in the grander narrative of human existence. Indeed, communally owned and managed land represented a form of social provisioning that was central to most pre-industrial and indigenous societies (Polanyi 2001, p.48). Eco-socialist Joel Kovel notes common property arrangements in the laws of ancient Babylonian, Aztec and Islamic societies, for instance (in Wall 2014, p.9). Commons scholar Derek Wall, meanwhile, describes indigenous societies in Australia, North America and India in which “the concept of buying and selling land was alien” (2014, p.9). It was instead social institutions of rights to use commons and social norms and obligations that *restricted* personal use of life-supporting commons that allowed most societies to continue using them.

Common rights to ecological resources, in particular, are indelibly linked to an ethics of care and stewardship that aims to preserve and maintain commons for the use of future generations.

In light of humanity's deep history of common property relationships, there is an inherent absurdity in NewSpace claims that future space colonies should be founded on principles of private rather than common ownership, as though exclusive ownership rights were the sole determinant in human flourishing. Even the British jurists and political theorists who helped codify or justify the foundations of private property rights in the Western political canon acknowledged that common property naturally preceded any concept of exclusive ownership (Blackstone 2019 [1893]; Maine 2007 [1917]; Locke 1690). Quoting from the Bible, the jurist William Blackstone said that God gave man "dominion over all the earth", and that the "earth, therefore, and all things therein, are the general property of all mankind" – a statement which seems to legitimate common property as the foundational social institution on Earth, albeit from a Judeo-Christian perspective (Blackstone 2019, ch.1, s.3). Yet an axiom within NewSpace and neoliberal discourse is that "at the basis of all economic prosperity on Earth is the right to private property", to use an example from the Cato Institute's *Space – The Free Market Frontier* (Hudgins 2002, p.xxiv).

Karl Polanyi's anthropological critique of liberal economics is valuable in addressing this ahistorical valorisation of private property ownership. The central thesis of his *Great Transformation* (2001) rests upon a distinction between economic relations of market capitalism and those of non-market or pre-industrial societies. Among other anthropologists, he drew on Malinowski's *Argonauts of the Western Pacific* (1984 [1922]) which described reciprocal, non-monetised trade in Melanesian island societies. He noted that fellow historical sociologist Max Weber was "the first among economic historians to protest against the brushing aside of primitive economics as irrelevant to the question of the motives and mechanisms of civilised societies" (Polanyi 2001, p.48).

We will return to Polanyi's critique of market capitalism shortly, however his work underlines the fact that communal property arrangements are ubiquitous in human history, while capitalist markets for privately-owned resources are a relatively recent social institution. He argued that:

"...man's economy, as a rule, is submerged in his social relationships. He does not act so as to safeguard his individual interest in the possession of material goods; he acts so as to

safeguard his social standing, his social claims, his social assets. He values material goods only in so far as they serve this end” (ibid, p.48).

The provisioning of essential resources (food production, most importantly) has clearly taken place through alternate allocation mechanisms. Polanyi focused on three alternatives to the ideal of a self-regulating market: reciprocity (mutual obligation, as in the case of the Trobriand islanders), redistribution (or centrality, as was common in ancient empires like the New Kingdom of Egypt and Hammurabi’s Babylon) and householding (Polanyi 2001, pp.49-56). Polanyi notes that householding – essentially the autarkic production of goods by smaller social units like the family – was described as *oikonomia* in Ancient Greece, the source of the contemporary word ‘economy’ (ibid, p.55). Economising and trading were processes embedded in political, legal and cultural institutions. For the majority of human history, trade and exchange for individual profit was close to non-existent and there was no prior evidence of a society “even approximately controlled and regulated by markets” (ibid, p.46). Polanyi noted that Adam Smith’s famous declaration of our supposedly innate ‘propensity to barter, truck and exchange’ rested upon highly selective, short-run historical evidence from the 18th and 19th centuries onwards. The period in which people appeared to have this propensity is precisely when capitalist markets forced them to do so (ibid, p.47).

2.1.2 Codifying property relationships: from ancient Rome to medieval England

The OST-CSLCA debate is rooted in western legal tradition, and most scholarship locates the earliest Western formalisation of rules and customs governing common areas in Roman categorisations of property (Rose 2003; Wall 2014; Flomenhoft 2018). Ancient Roman civil law delineated and codified different forms of property ownership in written ‘official’ forms. Roman common property or *res communes* denoted spaces and material objects that could not be owned exclusively and were to be used by everyone – natural resources like air and water, for instance. *Res communes* was delineated from other types of property, such as privately-owned homes and possessions (*res privatae*), publicly-owned property like roads and public services (*res publicae*) and things unowned (*res nullius*), such as the seas outside Roman jurisdiction (Wall 2014, pp.8-9). Many have noted that non-exclusive property rights have either been “generally overlooked” (Wall 2014, p.9) or have “rapidly [vanished]” in recent centuries (Rose 2003, p.91). Yet the modern legal systems of Europe, England and the United States are influenced by these Roman precedents, which were

codified in Emperor Justinian's *Corpus Juris Civilis* during the 6th century.⁵¹

English social and political history involved several notable shifts in human relationships to the land. Britannic land law traditions were modified drastically by Roman colonisation and then by Anglo-Saxon (5th-6th centuries) and Norman (11th century) conquests. Anglo-Saxon laws of the land were highly localised and customary. These included common rights to use lands and resources, such as rights of usufruct that allowed peasants to extract from the private fiefdoms of local lords and thegns. These ranged from: 'pasturage', which allowed for animal grazing in pastures; the right of 'estover' conferred the right to take timber or bracken from forests; 'piscary' granted the right to catch fish in waterways; while 'common in the soil' permitted one to extract minerals, sand and gravel for building rudimentary dwellings (Wall 2014, p.8). Categories of property rights emerge out of the human need for food, living space and dwellings – in Blackstone's words, "necessity beget property" (2019, ch.1, s.9). These subsistence-based usufructuary rights make a sharp contrast with the for-profit, private extractive rights granted under the CSLCA – the comparison between these two forms of property suggests that usufructuary rights will be far more valuable in the hostile environs of space.

The year 1066 is transformative in the history of sovereignty: the Norman conquest imposed the feudal system over Anglo-Saxon land law. The invasion created new social hierarchies in England and centralised political authority over land. William of Normandy brought from France to medieval England, Scotland and Wales a system of formal legal order predicated on a social hierarchy that placed the sovereign monarch second only to God. In conquering England, William claimed all land in his name, making it Crown or demesne land and subject to no superior landlord – allodial or radical title, it has been called (Schmitt 2003, p.47). It was a sweeping declaration of monarchical sovereignty, delegating limited authority to rural landowners while restricting the availability of common space for the commoners. With allodial title vested in the King, grants to feudal baronies were devolved from sovereign authority over the realm. The manorial 'lords of the soil' possessed the right to manage land and extract services from serfs and villeins living on this land. The landed elite transferred

⁵¹ The Roman civil law tradition has had greater influence on continental Europe than on the common law systems of England and America (the key difference being greater complexity in and adherence to codification in civil law systems than the emphasis on judgement, interpretation and precedent in common law systems). However, legal formalism in Western political history involves convergence of these two systems. This is due in large part to medieval scholarly interest in the legal philosophies of ancient Rome, Greece and Christianity from the 11th century onwards, particularly figures influential in the development of natural law: Thomas Aquinas (1225-1274), Jean Bodin (1530-1596) and Hugo Grotius (1583-1645), among others.

these rights to their heirs through inheritance. In the 17th century, Gerrard Winstanley had declared the root of the enclosure problem to be “the Norman Bastard William”, and the longstanding “pursuit of that victory, imprisoning, robbing, and killing the poor enslaved English” commoners (1649).

We will return to enclosure in more detail in the following section, however the *Magna Carta* represents an important step in the formalisation of property rights to land which, in turn, shaped land law across much of the globe. The *Outer Space Treaty* (OST) is often described as the *Magna Carta* of space (e.g. Smith 2018). Both the OST and the 1215 ‘Grand Charter of Liberties’ established “the basic rights, duties, and responsibilities” common to all signatories (Smith 2018, p.50). While both the OST and the *Magna Carta* involved limitations on sovereign authority and the recognition of common rights to a space, the former evolved out of the anticipatory geopolitics of the Cold War and the latter emerged out of disputes between the Crown and the landowners.⁵² The question of private property is (unsurprisingly) answered more clearly in the *Magna Carta*. The *Magna Carta* established that “no freemen shall be taken or imprisoned or disseised [dispossessed of lawfully-obtained property]...except by the lawful judgement of his peers or by the law of the land” (Article 39). The legal rights of private landowners were enshrined in what became the blueprint for the American constitution and the very concept of the rule of law.

While the Charter extended some liberties to serfs, it was concerned primarily with the political freedom of wealthy elites who sought to limit the arbitrary power of the Crown through constitutional law. These elites represented themselves in decision-making fora from 1265 onwards, in what became the House of Commons by the 14th century. Parliamentary representation was spurred in large part by the desire of property owners to make decisions about their own property, and parliamentarians were most commonly wealthy landowners. The ‘bourgeois state’ that Marx critiqued in the 19th century has deep roots: the pace of enclosure in the four centuries prior was testament to the enduring self-interest of empowered landowning elites. The former tenants of common lands were conscripted into waged labour through sovereign powers of legal appropriation, “the law itself [becoming] the instrument of

⁵² Andro Linklater’s history of ownership notes that in Roman law, “rights of property went with the land itself, rather than existing separately” (2015, p.30). The *Corpus Juris Civilis* inscribed a system of mutual obligation between sovereign and landowner, whereby landowners guarded land on behalf of the ruler and if “an estate be confiscated, or its inheritance disputed, the contract of mutual obligation disappeared and with it the rights of ownership (ibid, p.30). In limiting dues and loyalties that landowners were bound to pay to the Crown, the *Magna Carta* represented a break from Roman concepts of mutual obligation in land (in addition to mutual obligation under feudal tenure).

the theft of the people's land" (Marx 2015 [1887], p.513). As industrialisation and world trade opened up opportunities for profit, the cultivation and improvement of land was geared less towards subsistence and more towards landowners' accumulation of wealth and national economic goals. National government supplanted the monarch as the sovereign authority of the realm, and the capacity to authorise and legitimise rights to property in land was similarly vested in the new governmental form of the liberal capitalist state.

2.1.3 Property in American traditions of freedom and law

When Britain colonised the 'new' world in the 17th-19th centuries, this "concept of exclusive property in land, as a norm to which other practices must be adjusted, [extended] across the whole globe, like a coinage reducing all things to a common measure" (Thompson 1993, p.164). When English common law arrived in North America with 17th century colonists, the paradox of liberal private property came with it. Protected by the state from the state, the rights of private landowners were secured against arbitrary exercises of sovereign power. Yet the legitimacy and social recognition of their ownership claims were equally dependent on this sovereign power (and its ability to violently appropriate land from traditional custodians). This paradox continues in NewSpace's desire for private property-based off-world freedoms.

English colonists were neither the first peoples nor the first Europeans to settle the American continent. They were, however, the first to establish legal traditions of private property rights. In Cohen's words, "property denotes not material things but certain rights" (1927, pp.11-12) and the language of fundamental rights permeates American political discourse. The *Declaration of Independence* established new independent sovereign states (the Thirteen Colonies) that would legitimise, authorise and protect the rights of individuals (as with the French Revolution, these rights were generally confined to white men). They were rights secured for free men against the tyranny of the British Empire, the sovereignty of a new Commonwealth rejecting the monarchical sovereignty of the Crown.

Libertarianism is an enduring philosophy in American politics, and NewSpace advocacy for off-world mining rights is often inflected with patriotism and recourse to the Great Men of American history (e.g. Tumlinson, in Tierney 1999; Hudgins 2011). What is property, within libertarian politics? It is a fundamental, self-evident and supposedly inalienable freedom. Thomas Jefferson's famous declaration of individual liberties located the ultimate authority in God, not in the King. Declaring their independence from the

Kingdom of Great Britain, the *Declaration* asserted that the men of the Thirteen Colonies were ‘created equal’ and ‘endowed by their Creator with certain unalienable Rights’. Individual liberty is enshrined in the *Constitution of the United States of America* and its first ten amendments under the *Bill of Rights* (both inspired by Britain’s 1689 *Bill of Rights*). The US *Bill of Rights* contains some components highly-cherished by numerous libertarian movements, in particular the anti-expropriation measures – that no person’s “private property be taken for public use” (Fifth Amendment). Barbrook and Cameron (1996) identify a Jeffersonian democratic strain that is evident in techno-libertarian movements like NewSpace. Jefferson believed that “political liberties could be protected from authoritarian governments only by the widespread ownership of individual private property” (Barbrook & Cameron 1996, p.59). The NewSpace concept of ‘freedom’ similarly links political freedoms to the freedom of private possession.

In his emphasis on individual rights, Jefferson was influenced by English liberal political theorist John Locke. Indeed, beneath the lofty claims of their humanitarian-environmentalist mission, NewSpace justifications for private rights to off-world mineral resources appear to draw on the familiar Lockean proviso, as Gangale (2009) and Pilchman (2015) have identified. In his *Second Treatise of Government* (2005 [1690]), Locke followed Blackstone and Jefferson by commencing his inquiry with recourse to divine gifts of common property: “God...has given the earth to the children of men—given it to mankind in common” (2005, s.25). Locke’s challenge was to justify the private ownership of formerly commonly-owned things – effectively, to justify the act of appropriation itself within the Judeo-Christian presumption of common property (Waldron 2016). Locke famously argued that “every man has a property in his own person...The labour of his body, the work of his hands...are properly his” (2005, section 27). If an actor “mixed his Labour with” land or natural resources he “thereby makes it his property”; so long as “there is enough, and as good, left in common for others”, then appropriators have a justifiable right to private ownership that “excludes the common right of other men” (ibid, s.27).

It was an attempt to ground private property ownership in natural law: rights to exclusively own property existed independently of government, they only needed to be enforced by government. In this philosophy, the preservation of private property should be the central aim of government and civil society, and Locke’s *Fundamental Constitutions* of the Carolina colonies treated private ownership of land as the basis of membership in political community (Armitage 2004). Locke’s theorisation of private property thus promoted individual liberty while justifying the existing social hierarchy of his time (Marshall & da

Rimini 2018, pp.51-52). Locke's justification of property also legitimised private ownership of human beings (and Jefferson was a slave owner). Slaveholders enjoyed "absolute arbitrary Power, over the Lives, Liberties and Persons of [their] Slaves" while slaves were granted no legal standing let alone the constitutional rights to life, liberty and property enjoyed by white men (Locke, in Armitage 2004, p.619).

In NewSpace cosmopolitics, space mining becomes an act of Lockean 'original appropriation'. In the words of Deep Space Industries' (DSI) CEO David Gump, 'space resources belong to those who show up' (2018). Locke's individualisation of property rights denies the deep human history of co-operation and collaboration in the use of land and resources. NewSpace, meanwhile, proclaims that private and not common ownership of off-world resources is preferable for the humanising of the cosmos. Locke's project not only justified the racial hierarchy of the Carolina colonies, but it presented an argument that legitimised the white conquest of the entire American continent. Since he considered that there would always be enough land 'left in common for others', the mass appropriation of land from Native American societies was constitutionally legal and morally acceptable. Much like the *terra nullius* arguments deployed by the British Empire, Locke's argument treated "uncultivated land [as] essentially valueless" and blind to the fact that "at some point the land must cease to be sufficient to support the pre-existing hunter-gatherer population" (Quiggin 2015).

Space mining also raises concerns about social hierarchy and over-exploitation, yet these ethical considerations are transformed on the space frontier. The embryonic space mining sector believes it has an inalienable right to own resources extracted from space, because it would be their labour (or at least their capital) that has 'mixed' with asteroids and other celestial bodies, thereby "[removing] it out of that common state nature left it in" (Locke 2005, s.31). Space is considered a limitless cornucopia of iron, nickel, platinum, gold, water ice, nitrogen and many other minerals, surely enough to satisfy the Lockean criteria of leaving enough 'in common for others'...

Yet the 'first come, first served' logic of Locke's labour criterion is likely to perpetuate to Earthly inequalities between and within nations (Pilchman 2015, pp.142-143). The Solar System has commons of almost unfathomable scale, yet early space miners are likely to pick the low-hanging fruit – the sites of mineral extraction that are easier to reach and more profitable than others. These reserves could be exploited by American space miners before less developed countries were capable of doing the same (thereby preserving the existing 'space hierarchy'). If the alleged promise of *in situ* resource processing and

manufacturing is realised, then being the first to exploit lunar resources might make one company more capable of exploiting the minerals of near-Earth asteroids, and so on towards Mars and the asteroid belt. The advantages of being first-movers could increase exponentially. If the use of space resources became important in the future, would NewSpace – a political movement emphasising individualism and market-based competition – be interested in leaving ‘enough, and as good’ in common for future generations?

Exactly how individual actors (NewSpace or otherwise) conduct off-world resource exploitation remains to be seen, yet it is obviously true that extractive forms of land use irreversibly deplete resources. Capitalism thus requires new frontiers to extract from. Here, we can turn to the notion of the ‘spatio-temporal fix’ proposed by Marxist geographer David Harvey (1981; 2004), whose work has previously been utilised in exploring off-world capitalism (Dickens & Ormrod 2007; Shammass & Holen 2019). Harvey elaborated on Marx’s understanding of capitalism’s crises of overaccumulation: “an excess of capital in relation to the opportunities to employ that capital productively” which, in the absence of the geographic expansion of capitalist markets, would eventually devalue capital (Harvey 1981, p.7). As Shammass and Holen surmise, “Capitalism must regularly discover, develop and appropriate new spaces because of its inherent tendency to general surplus capital...there is no end point or final destination for capitalism. Instead, capitalism must continuously propel itself onwards in search of pristine sites of renewed capital accumulation” (Shammass & Holen 2019, p.5). If capitalism is to be the vehicle by which NewSpace colonialism is realised, then there will be no inherent upper limit to the appropriation of resources and accumulation of capital – and nothing to stop the perpetuation of Earthly economic hierarchies off-world. The very existence of space mining firms is an expression of the economic inequality inherent in the capitalist spatio-temporal fix, as private investment in NewSpace firms “creates a productive (or valorizing) outlet for excess capital” accumulated by investors like Peter Thiel and Jeff Bezos (Shammass & Holen 2019, p.5). The concept of the spatial fix also serves as a reminder that any profits from corporate mineral exploitation would accumulate with company owners and shareholders – social hierarchies both between and *within* technologically-advanced capitalist countries would also be perpetuated.

Returning to our original framing of property as a series of social relationships, the history of property rights reveals clear limitations in a Lockean natural law justification for the private ownership of space resources. Title IV of the CSLCA states that US citizens (including the ubiquitous ‘legal person’, the corporation) “shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the

asteroid resource or space resource obtained” (CSLCA 2015, s.51303). One actor (such as an American space mining company) has been entitled by another (the US legislature) to take a range of actions in relation to an object (resources extracted from celestial bodies). In Sikor and Lund’s words:

“The process of recognition of claims as property simultaneously works to imbue the institution that provides such recognition with the recognition of its authority to do so. This is the ‘contract’ that links property and authority. Property is only property if socially legitimate institutions sanction it” (2009, p.1).

Space miners’ future claims to space property are recognised in US public law, implying that the US Congress has the authority to allocate private property rights in the extra-territorial spaces of the Solar System. This either suggests that the socially legitimate institution for recognising off-world property claims is the US Congress and not the United Nations or any other international decision-making body, or it suggests that the CSLCA is an illegitimate declaration of private property rights.

Common and private property involve power relationships of authority, consent and legitimacy. NewSpace and (neo)liberal discourses that treat private property as an essential human freedom evade these unavoidable questions of state power and authority. In neoliberal private property discourse, the ‘minimal state’ defines and enforces property rights – beyond this, the marketplace is considered a more efficient co-ordinator of exchange relationships between people in relation to property. Neoliberal environmentalism has thus entailed “the creation of private property rights to pollute; the growth of user fees for ‘public’ nature reserves; and the privatisation of all manner of natural resources, from fisheries to forests to water” (McCarthy & Prudham 2004, p.277).⁵³ Neoliberal approaches to property involve the authority of a new power, one which is embodied in neither the king’s body nor the body

⁵³ We will return to NewSpace as an expression of neoliberal environmentalism in chapter 6. Here it is worth noting that off-world private property rights are, in one key sense, a divergence from neoliberal approaches to the commons. The commodification of nature is central to neoliberal claims to environmental conservation: it has been argued that the social and environmental costs of pollution (‘externalities’) can be internalised through private ownership. Ronald Coase (1960) of the Chicago School had proposed that such ‘problems of social cost’ could be resolved through clearly defined property rights and negotiation between contracting parties. The ‘Coase theorem’ has been influential in neoliberal environmentalism, which has enshrined private property-based markets as the mechanism through which to address questions of atmospheric pollution, among other examples. NewSpace similarly proposes private property rights as a means of reducing centralised (state) decision-making in the future space economy, but not under any pretence of internalising pollution in the space commons. NewSpace has generally treated private property as an incentivisation measure for private investment in space mining enterprises, rather than as a means of resolving potential tragedies of the space commons (Hardin 1968). NewSpace actors claim that exploiting outer space will conserve the resources of Earth, but outer space is not itself a site for resource conservation.

politic. The decentralised and omniscient market is treated as sole, legitimate authority for managing property relationships. The power of government (whether democratic or authoritarian) is replaced with the market and its price signal as the arbiter of relationships between people and nature (Mirowski, Walker & Abboud 2013). But could there ever be such a thing as a truly ‘self-regulating’ market?

2.2 Karl Polanyi and ‘fictitious’ commodification

In chapter 1, we discussed how the most significant achievements in American spacefaring are due to NASA’s central coordination of space R & D and mission planning. NewSpace claims that government action is hindering its space utopia mirror those of liberal philosophers from Malthus and Ricardo to Mises and Lippman who claimed that “power and compulsion are evil, that freedom depends on their absence” (Polanyi 2001, p.266). We will now turn to anthropologist, historian and institutional political economist Karl Polanyi, who critiqued this version of ‘freedom’. His seminal work, *The Great Transformation* (2001 [1944]), arrived in a period when human activity in space was limited to the sub-orbital missile program of the Third Reich and when the Mont Pèlerin Society was yet to convene. Nonetheless, Polanyi’s ‘fictitious commodities’ concept is helpful for approaching the relationship between national and private appropriation (the OST-CSLCA question) and for critiquing the NewSpace and neoliberal myths of ‘small government’ and ‘de-regulation’. Polanyi revealed that contrary to the economic liberal’s “emotional faith in spontaneity”, “regulation and markets...grew up together” (Polanyi 2001, p.35, p.71). The expansion of capitalist markets represented an attempt to “subordinate the substance of society itself to the laws of the market” (ibid, p.75). At stake in the CSLCA is the potential embedding of celestial bodies of the Solar System within the market’s logic of competition, accumulation and depletion, which I argue will foreclose the possibility of equitable human futures in space.

Von Hayek and von Mises and other neoliberal theorists had aristocratic backgrounds and seemed to write with an ingrained elitism – contemporary neoliberals share this detached contempt for the *demos* (e.g. Thiel 2009). In contrast, Polanyi’s academic career reflected his participation in social democratic political movements and an ongoing concern with the fate of the working classes. Born in Budapest to Austrian parents, Polanyi’s life (1886-1964) and career involved a politically active, trans-disciplinary path of “lawyer turned journalist turned

economic historian” during one of the most tumultuous periods in European history (Isaac 2012, p.13). Following Béla Kun’s 1919 Communist overthrow of the Hungarian Social Democratic government, Polanyi emigrated to Vienna and soon undertook studies in economics and sociology while also editing the financial newspaper *Der Österreichische Volkswirt* (The Austrian Economist; Polanyi-Levitt & Mendell 1987, p.13). Here, he would directly engage with liberal economists like Mises by critiquing their faith-like espousal of the ‘liberal creed’ (Polanyi 2001, ch.12). His cynicism regarding the Viennese liberal revival (discussed in section 1.1.1) was partly fuelled by the 1929 US stock market crash. The Great Depression precipitated the collapse of European central banks like the Austrian Kreditanstalt in 1931, which he argued had played a central role in the rise of fascist movements (Block 2001, p.xx). He also witnessed the “unexampled moral and intellectual rise in the condition of a highly developed industrial working class” under Viennese municipal socialism, and this inspired the social democratic remedies he proposed in *The Great Transformation* (Polanyi 2001, p.299).

In 1944, Friedrich Hayek published *The Road to Serfdom*, which considered Keynesianism and social democracy to be the first steps that capitalist countries were taking on an interventionist, ‘slippery slope’ towards fascism and communism. In the same year, Polanyi published a scathing critique of economic liberalism, its *laissez-faire* fantasies and the social consequences of its delusions. Several scholars have recently drawn attention to what was Polanyi’s sole major work, because *The Great Transformation*’s focus on the institutional basis of supposedly ‘free’ markets is as valuable in explaining 21st century neoliberalism as it was for critiquing 19th-20th century aspirations to *laissez-faire* self-regulation (Block & Somers 2014; Cahill 2014).

Polanyi argued that visions of economic freedom predicated on freedom *from* government were themselves a fantasy. NewSpace’s anarcho-capitalist discourse similarly attempts to frame economic freedom as being independent of government regulation (e.g. *Orphans of Apollo* 2008; Tea Party in Space 2014). Market freedoms wielded by economic elites are instead enabled and safeguarded by the legal and administrative functions of state institutions. Throughout his history of market society, Polanyi demonstrated that “the road to the free market was opened and kept open by an enormous increase in continuous, centrally organized and controlled interventionism” (2001, p.146).⁵⁴ Polanyi was interested in the

⁵⁴ Block and Somers (2014) note how, in attempting to distance himself from Marx’s more deterministic conceptions of social change, Polanyi very rarely uses the word ‘capitalism’ – ‘market society’ is instead his

critique of utopia, but neither a society void of private property like that envisioned by Thomas More (or indeed a Marxist utopia of the ‘withering away of the state’ via socialist revolution), nor an escape from ecological limits via techno-infinitude (as per NewSpace). *The Great Transformation* is about the “crusading passion” held by 19th and early 20th century classical liberal economists (Polanyi 2001, p.143) for an “autonomous self-governing entity” that “cannot possibly be realized” (Block & Somers 2014, p.9). In Polanyi’s words:

“...the idea of a self-adjusting market implied a stark utopia. Such an institution could not exist for any length of time without annihilating the human and natural substance of society; it would have physically destroyed man and transformed his surroundings into a wilderness” (2001, p.3).

Polanyi considered free market capitalism to be a ‘stark utopia’ because there was no such thing as a ‘self-adjusting’ market – only markets created through “statecraft” and continuous government intervention (2001, p.35). For markets to self-regulate via the price mechanism and ‘laws’ of supply and demand, the key factors of production in industrial capitalism – nature, human beings and money – would have to be “transformed into commodities in order to keep production going” (ibid, p.75). Nature, humans and money became land, labour and capital, respectively.⁵⁵ Pursuing the liberal economic utopia of self-regulating markets meant allowing “the market mechanism” to take precedence over other social institutions in directing the fate of humanity and nature (ibid, p.76).

Polanyi argued that treating land, labour and capital as tradable private property was ‘fictitious’ because these factors of production predate the formation of capitalist markets and the state-created legal orders that sustain them. Natural resources such as this are thus distinct from ‘genuine’ commodities that are produced by wage labour for the explicit purpose of market exchange.

“...labor, land, and money are obviously not commodities; the postulate that anything that is bought and sold must have been produced for sale is emphatically untrue in regard to them. In other words, according to the empirical definition of a commodity they are not commodities. Labor is only another name for a human activity which goes with life itself, which in its turn

preferred label for industrial capitalism and the new relationships of wage labour, property law and international trade that came with it.

⁵⁵ Capital as a ‘fictitious commodity’ is perhaps the least intuitive element in Polanyi’s theory. In emphasising the role of the use of the gold standard in international trade, and the pressure this place on domestic agricultural policy, Polanyi’s description of fictitious capital involved a distinction between money as a token of social value, trust or prestige (as in the Trobriand Islanders) and a commodity form of money (as per foreign exchange and currency trade) that subjected money to the price movements of market exchange.

is not produced for sale but for entirely different reasons, nor can that activity be detached from the rest of life, be stored or mobilized; land is only another name for nature, which is not produced by man; actual money, finally, is merely a token of purchasing power which, as a rule, is not produced at all, but comes into being through the mechanism of banking or state finance” (ibid, p.75).

Preceding the Western environmental movement by at least two decades, Polanyi explains the fictitious commodities concept with much greater emphasis on labour and capital than on land or “raw materials” of natural resources (ibid, p.44). Nonetheless, the state guarantee of private property rights on asteroids and other celestial bodies offers a stark example of fictitious commodification. Some asteroids have been dated to 4.5 billion years old and are as old as the Earth and Solar System: the exo-geological processes that created off-world minerals could not be further in time and space from the origins of market capitalism. While there is no ‘commoner’ to expel from outer space, off-world minerals would become private property not through the fictional ‘natural’ appropriation that Locke described, but through acts of state-supported appropriation.

Polanyi’s account of enclosure emphasises how the transformation of common property into formalised private property rights to land and natural resources are grounded in state sovereignty. He describes the waves of enclosure legislation, from the Tudor (1485-1603) and Stuart periods (1603-1714) and onto to the consolidation of global trade networks in the 18th-19th century. The enclosure movement resulted in a “catastrophic dislocation of the lives of common people” and destruction of “old social tissue” of village life and its laws and customs (Polanyi 2001, p.35). Much like the Silicon Valley and neoliberal elitism propelling the prospective enclosure of the off-world commons, Polanyi notes how the English enclosure movements were “a revolution of the rich against the poor” and that Parliament “had been on the side of the enclosers” (ibid, p.37-38). Numerous revolutions benefitting wealthy elites have taken place under neoliberal capitalism, from the commodification of public water supplies in Latin America to Google’s commodification of internet users’ personal data (a project supported by ongoing collaboration between Google and the US Intelligence Community; Nesbit 2017).

Polanyi’s ‘fictitious commodities’ concept underlines how the functioning of capitalist markets is utterly dependent on “deliberate State action” (Polanyi 2001, p.147). This poses a problem for the legality of NewSpace’s colonisation project under international law. Contrary to the liberal economists’ invocations of the ‘invisible hand’, ‘free’ and self-regulating markets “controlled, regulated, and directed by market prices” depended on

ongoing intervention of the state and the legal-coercive organs of government (ibid, p.71). Commodifying nature and thereby ensuring “predictability in the market for land” necessitated “sets of rules as to what types of economic activity are permitted in particular localities”, and this engendered government administration and regulation in the form of private property rights, land surveys, the creation of localities and their boundaries, and the development of public infrastructure that would enable access to land (Block and Somers 2014, p.33). Realised through “legislative action” and “administrative pressure” as much as they were by “individual force or violence”, enclosures involved deliberate and unspontaneous commodification rooted in the ability of national government to appropriate from the commoners (Polanyi 2001, p.189). We will return to the connection between violence and the enforcement of private property in Chapter 5. Here I will emphasise that the value of Polanyi’s account vis-à-vis space resources law is in his demonstration that – at the birth of market capitalism – national and private appropriation were fundamentally entwined.

The CSLCA’s guarantee of private property rights to space resources under US public law rests upon an equally blurred boundary between private and national appropriation. That ‘private’ appropriation of space resources would rest upon ample support of the nation state is also evident when we consider forms of ‘statecraft’ outside the establishment and enforcement of formal private property rights. Shammass and Holen argue that, “Space libertarianism is libertarian in name only: behind every NewSpace venture looms a thick web of government spending programs, regulatory agencies, public infrastructure, and universities bolstered by research grants from the state” (2019, p.6). Polanyi emphasises that a broad array of public institutions support ‘free’ markets, and state buttressing of the space mining industry is apparent well before any robotic miners are dispatched off-world (and, should that ever happen, they would likely be dependent on publicly-owned launch pads or government-supported space launch firms like SpaceX or the United Launch Alliance). Data from the Federal Procurements Data System reveals some significant funding in the form of NASA research grants, most commonly for basic research and technology development. Planetary Resources have received \$1.8 million since 2014 (FPDS 2018a), Deep Space Industries (DSI) have received \$1.5 million since 2014 (FPDS 2018b) and Moon Express have received \$610,000 since 2010 (FPDS 2018c). Moon Express have also been awarded a \$10 million contract to supply NASA with data arising from the company’s lunar flight testing (NASA 2010). This public expense is often supported with cost-sharing from private investors and is dwarfed by the multi-billion dollar contracts awarded to Boeing and Lockheed-Martin, but these injections of public funding are crucial to the survival of an industry currently incapable

of selling its key commodity (off-world resources).

That NewSpace is a neoliberal rather than libertarian project is revealed most clearly by DSI co-founder Rick Tumlinson, who explicitly describes the continuous injection of public revenue into NewSpace enterprises that is essential for their off-world free market utopia to have any chance of success. His article entitled ‘Government and Space: Lead, Follow and Get Out of the Way’ includes a list of demands for the US Government:

“Declare that our national goal in space is settlement and resource development...Implement pro-settlement laws and policies...Support the genius of American space enterprise...Purchase goods and services from commercial vendors in every possible area of activity (Buy the ride, not the rocket!)...Become a solid customer for data and information acquisition from space...Move to the edge and build in commercial handoff from the beginning of exploration plans (eg. practice for Mars on the Moon, then hand off the infrastructure needed to do so” (2012).

Before they can ‘get out of the way’ of ‘the genius of American space enterprise’, NASA and Congress are being asked by NewSpace to provide quite an expansive array of corporate ‘space welfare’ measures: incentives, infrastructures, subsidies and legislative frameworks, while also being a ‘solid customer’. NewSpace attacks upon centrally-coordinated space agencies resonates with the incongruity Polanyi identified in “economic liberals [who] must and will unhesitatingly call for the intervention of the state in order to establish” the institution of self-regulating markets (Polanyi 2001, p.155). The bureaucratic oversight of NASA and the US Government is simply to be replaced with new bureaucracies and state institutions that primarily pursue the commercialisation of space endeavour.

Polanyi’s work also points to the fallibility of libertarianism as a coherent philosophy of private property. The Lockean proviso belies the social nature of property and economy, what Polanyi described as ‘the reality of society’ (2001, ch.21). Liberal economics describes an atomised, individualised and frictionless society that bears little resemblance to how political communities – at local, national and international scales – actually work. The liberal individual does not ‘create’ property out of their own labour. Political and cultural institutions enable, legitimise and authorise property ownership, whether common or public or private property. As Bromley argues, “*all property rights flow from the collective* as opposed to flowing from some alleged ‘natural rights’ that are claimed to be logically prior to the state” (1991, p.5, emphasis in original). Corporate freedoms to appropriate from the space commons would be grounded in state power, rendering a natural rights conceptions of off-world private

property unfeasible.

NewSpace has spent decades lobbying Congress for legislation that creates a national framework of private property rights in space or more generally for Federal funding of their projects. This suggests they understand any space exodus predicated on decentralised, individual freedoms actually needs continuous public support if it is to succeed. So wherein lies the appeal of ‘small government’ or self-regulating markets? NewSpace actors make the reasonable claim that turning space exploration over to the market would engender new forms of ‘public-private partnership’ that may reduce taxpayer expense (e.g. ASD 2016, p.4). Yet beneath the disavowal of bureaucratic largesse are some familiar refrains of American libertarianism. Somers and Block summarise Polanyi’s appraisal of the ‘free’ market utopia thus: “Because politics is tainted by a history of coercion, the idea that most of the important questions would be resolved through the allegedly impartial and objective mechanism of choice-driven, free-market competition has great appeal” (2014).

NewSpace and neoliberalism seek to escape a form of coercion different to the violence of enclosure. This liberal economic utopia means freedom from the consequences of the inequality produced by free market economics – it would be a utopia void of reciprocal responsibility to society in the form of ‘coercive’ taxation, bureaucracies that oversee and manage taxpayer expenditure, resource rents or limits imposed on what can be appropriated. The libertarian aversion to taxation is particularly pronounced in NewSpace advocacy: NewSpace actors have made clear that they believe space corporations should pay as little tax as possible, while many of the organisations themselves lobby for taxpayer expense while registered as 501(c)(3) tax exempt organisations (e.g. Rohrabacher 2002; Tumlinson 2012; Space Renaissance USA 2020 [2011]).

While I have focused on ‘real’ mining rights rather than intellectual property rights, it is important to note that many of the knowledges and technologies that enable spacefaring rest upon a collective or public form of intellectual property (particularly since so much scientific knowledge is produced by publicly-funded educational institutions). In order leave Earth at all, NewSpace actors would need to ‘stand on the shoulders of giants’, to use Isaac Newtown’s famous expression. The development of scientific knowledge in physics, chemistry, aerodynamics and spaceflight over the centuries forms part of an ‘information commons’ that (prior to commodification reforms that emerged the late 20th century, at least) all of us have access to. The Lockean theory of property is further undermined in this sense, because there are often “no clear boundaries between our own labour and general social labour” (Marshall & da Rimini 2018, p.52).

Polanyi points us back to the aporia at the heart of neoliberalism: the capturing of state sovereignty to create and fortify economic freedoms for empowered firms and individuals, while – under rubrics of *laissez-faire* and non-interventionism – defeating social democratic claims that would counter the unequal exercise of these freedoms.

“On the institutional level, regulation both extends and restricts freedom; only the balance of the freedoms lost and won is significant. This is true of judicial and actual freedoms alike. The comfortable classes enjoy the freedom provided by leisure in security; they are naturally less anxious to extend freedom in society than those who for lack of income must rest content with a minimum of it. This becomes apparent as soon as compulsion is suggested in order to more justly spread out income, leisure and security...The institutional separation of politics and economics, which proved a deadly danger to the substance of society, almost automatically produced freedom at the cost of justice and security” (Polanyi 2001, p.263).

Polanyi’s argument is that, if markets are underpinned by democratic institutions, then they can be directed towards democratic ends. His work may have been informed by the progressive gains made by Swedish social democratic government in the 1930s (Block & Somers 2014, p.281). Unlike Marx and Hayek, he saw greater potential for democratic institutions to address the injustices of market capitalism. He was a social democrat: he offered a vision of economic freedom that was grounded in justice, fairness and democracy, but was unsympathetic to state communism. His compromise between market capitalism and the collective good may be valuable in approaching the future of international space law, and countering the NewSpace claim that equitable space law engenders some form of tyrannical collectivism (e.g. NSS 2009).⁵⁶

Polanyi’s account of market capitalism is valuable for theorising the CSLCA as an act of state-backed enclosure and framing the NewSpace imaginary within the broader free market utopianism of (neo)liberal economics. It serves to counter the ahistoricity that mythologises capitalist markets as eternal, self-evident and inevitably leading to greater human liberty. However, Polanyi cannot offer much insight on enclosing space commons, when we consider the obvious fact that no prior community will be ‘fenced off’ from these commons. The OST involves a pre-emptive commoning of celestial bodies, much like the CSLCA pre-emptively encloses them. Polanyi’s work is unable to convey the unfamiliarity of

⁵⁶ We will return to Polanyi in Chapter 6. His concept of the ‘double movements’ – a destructive commodification movement followed by protective counter-movements (unemployment benefits, environmental protection and so on) – is interesting for discussing how new international laws of outer space might pre-emptively counter the unilateral, profit-based appropriations anticipated through the CSLCA.

outer space as a site for the imposition of private property ownership over a common property regime – perhaps no Earth-bound theory of political economy or legal geography adequately can.

2.3 Theorising the legal order of the ‘landless’ frontier: Schmitt’s concept of *nomos*

“Every new age and every new epoch in the coexistence of peoples, empires, and countries, of rulers and power formations of every sort, is founded on new spatial divisions, new enclosures, and new spatial orders of the earth” (Schmitt 2003, p.79).

As a way of framing the novelty of the space frontier in legal geographic terms, we will now turn to the controversial German jurist, Carl Schmitt (1888-1985). Both Schmitt and Karl Polanyi acknowledged the inevitability of politics and power – as do neoliberal theorists (Hayek 1986) and NewSpace private property activists. Yet Schmitt and Polanyi had different views on power, owing in large part to their career trajectories and political affiliations. Polanyi was a “world citizen” with a “deep sense of moral responsibility” (Block 2001, p.xxi); while Schmitt became entangled in the racial geopolitics of the Third Reich. Polanyi, a Christian social democrat, saw humanity as a ‘brotherhood’ of perpetual social bonds and believed the extension of democracy was central to human freedom (2001, ch.21). Schmitt, the Christian conservative and eventual National Socialist, saw community instead predicated on friend and enemy distinctions (1985 [1922]). Schmitt’s scholarly legacy is tainted by his justifications of Hitler’s consolidation of power and his post-war rejection of denazification. My intention here is not to mount ‘the author is dead’ arguments that divorce his ideas from the context in which they emerged. Rather, I will attempt to limit our discussion of Schmittian geopolitics to his etymological investigation of the ancient Greek term ‘*nomos*’ and its value in approaching the genealogy of international law – the latest chapter in which is the legal recognition of off-world private property.

Nomos has often been roughly translated as ‘law’ or ‘custom’, however Schmitt’s project re-appraised its meaning and ultimately described *nomos* as an explicitly spatial legal order (2003 [1950]). For Schmitt, *nomos* was “the fundamental process of apportioning space that is essential to every historical epoch” (2003, p.78). Schmitt’s employment of *nomos* went past what he perceived to be the inadequate interpretations of ancient Greek philosophy. Plato’s *nomos* represented “a mere rule” over land (ibid, p.67), while Aristotle’s

interpretation did better in communicating *nomos* as an “original distribution of land” (ibid, p.68). *Nomos*, for Schmitt, is a “constitutive act of spatial ordering” (ibid, p.70).

“The Greek word for the first measure of all subsequent measures, for the first land-appropriation understood as the first partition and classification of space, for the primeval division and distribution, is *nomos*” (ibid, p.67).

In Schmitt’s *nomos* of the earth, “land appropriation [is] the primeval act of founding law” (ibid, p.45). From nomadic societies to the empires of antiquity and through to the liberal international order, Schmitt described how law is “geographically situated and situating” (Dean 2006, p.6). The US Government’s contentious ability to confer private title or rights on US citizens in outer space derives from successive US governments appropriating from native Americans and rival state powers, thus becoming the supreme political authority over what is now US territory. English common law enshrined the sovereign with powers to lawfully appropriate from natives and commoners, a constitutional power owing to William the Conqueror’s appropriation of land from Anglo-Saxon societies, who had claimed the land in the wake of the Romans, who had appropriated it from Celtic tribes, and so on. “The history of peoples, with their migrations, colonizations, and conquests, is a history of land-appropriation (Schmitt 2003, p.328).

Nomos emphasises that *all* law derives from acts of land appropriation: sovereign authority, political legitimacy and privately-owned property all have the appropriation of land at their foundations. *Nomos* thus addresses the question of whether state and private powers over land are interlinked or independent concepts, an “age-old question” that is now being projected off-world (Pop 2000, p.275). Perpetuated by Blackstone and Montesquieu in the 18th century, the divide between the public law of sovereignty and the private law of property is a distinction that has directed the course of legal pedagogy (Cohen 1927, p.8). Private property was treated as a case of civil law, constituting the *dominium* of individuals over things – land, commodities and human and non-human life (ibid, p.8). Public law, meanwhile, was a case of political power, *imperium*: “the rule over all individuals by the prince” (ibid, pp.8-9). However, Schmitt argued that land appropriation is the “terrestrial fundament” from which both the *dominium* of private law and the *imperium* of political power are derived – it is the “archetype of a constitutive legal process” (Schmitt 2003, p.47).

What can Schmitt’s *nomos* tell us about outer space? How is political authority in outer space being ‘constituted’ through appropriation? To Polanyi’s emphasis on statecraft in enclosure, we can add Schmitt’s argument that – in the very act of settlement – there is a

fundamental indistinction between sovereign or national appropriation and the civic laws of private property. To pre-emptively make a legal guarantee of private property ownership is a de facto act of sovereign appropriation. If the allocation of private property rights over space resources derives from the sovereign authority of the US state, then the US (not just its corporate citizens) is pre-emptively appropriating from celestial bodies – at present, this is the authority from which any private ownership in space would derive. However, it remains to be seen whether an international regime, predicated on multilateral consensus, will regulate private resource appropriations in outer space.

We can also analyse the OST in terms of the Schmittian *nomos*: the 1947 establishment of the United Nations heralded a post-Westphalian international legal order that has more recently been termed ‘globalisation’, in which the sovereignty of the nation state is thought to be increasingly diminished. Yet, by taking statehood as its essential membership criterion, the United Nations preserved territoriality – the ‘law of the land’ – as a key, spatial determinant in international law. The terms of the OST effectively project the territorially defined authority of statehood into outer space, whilst also bringing deliberative politico-legal fora and norms that limit the scope of this statehood. The CSLCA represents an attempt – from one UN member nation, acting in the interests of commercial actors – to override the norms established by the other OST signatories.

However, *nomos* also problematises any attempt at describing the space frontier in legal geographic terms. The opposite of *nomos* is anomie (*anomos*), or lawlessness. Schmitt deployed *nomos* as a means of explaining the genealogy of international law, taking us from the empires of antiquity to the inter-state relations prevailing in the immediate post-war era.⁵⁷ A key step in this process was the concept of ‘amity lines’, in which the *jus publicum Europeum* (European international law) of pre-modern European empires made a distinction between lawful warfare on the European continent and a mutually-determined ‘space of exception’ on the anomic colonial frontier.⁵⁸ Colonial powers treated the lands of the many indigenous societies as *res nullius* – anomic ‘new’ worlds, in which the murder and enslavement of indigenous peoples could proceed without legal consequence, providing charter companies with new sources of land, resources and labour in the process. Colonialism or enclosure in outer space may not be as violent as these processes were on Earth. Yet the

⁵⁷ He thought perpetual peace would be based on a friend-enemy distinction at the level of regional blocs: US dominance of the Americas, and presumably Nazi Germany in Eurasia (2003, p.355).

⁵⁸ I will return to the *nomos* / *anomos* distinction when arguing that space resource appropriation bears several resemblances to maritime piracy and privateering in the expansion of the British Empire (Chapter 5).

CSLCA appears to similarly treat the off-world as anomic, a space in which to impose US public law on the off-world *nomos*, brushing aside the fundamental principles of the *Outer Space Treaty* in the process.

Schmitt's excavation of *nomos* inevitably brings us back to his political affiliations. The emphasis on land in understanding *nomos* smacks of the early 20th century ethno-political entwinement of 'blood and soil', best typified by Friedrich Ratzel's theory of *lebensraum* – the social need for 'living space' that would be used to justify Nazi imperialism in Europe. The O'Neillian dream of new, off-world living space – as fused with private property rights that are anchored in US sovereignty – indeed resembles geographer Isiah Bowman's (1878-1950) call for an "economic *Lebensraum* that would open up world commerce to American interests" (Smith, in O'Loughlin 1994, p.23).

Here, if we can limit our discussion of the Schmittian *nomos* to its more general framing of land appropriation as being constitutive of laws of property and sovereignty, we can see that extending these core political categories into what Buzz Aldrin called the 'magnificent desolation' of the off-world represents a break from millennia of landed human civilisations. Despite the commons-defining 'constitution' of the *Outer Space Treaty*, the Solar System might be considered 'lawless' in that it lacks laws established through new, foundational acts of land appropriation. Yet, like Polanyi's fictitious commodification of land (an essential component of human existence), the agricultural roots of *nomos* are confronted by the complete absence of life elsewhere in the Solar System.

2.3.1 Political theory on a lifeless frontier?

Polanyi and Schmitt offer useful concepts for exploring the NewSpace project and the CSLCA, yet their accounts of law and politics are problematised by the material characteristics of outer space. Life does not exist in the off-world, as far as we know. There is no soil in which we could grow crops, no air for us to breath and no ecosystems to provide us with nutrients. Human inhabitations of the space around Earth (let alone anywhere deeper into the Solar System) are entirely dependent on technological systems that – at great cost and complexity – can only temporarily imitate the life-supports of our home planet. The Solar System offers not *lebensraum* but *todesraum* – a space of death...

Let us now consider some of the sites that NewSpace actors have proposed for future colonial projects. Earth's Moon has been suggested as a site of habitation in Western science

fiction literature as early as Verne's *De la terre à la lune* (1865) and in American space policy pre-dating the Apollo Program.⁵⁹ NewSpace mining firm Moon Express have their sights on exploiting what they call 'Earth's 8th continent' (Moon Express n.d.). The Moon has temperatures that oscillate from -180°C to 130°C (Faure & Mensing 2007, p.154), days and nights that last a fortnight, no atmosphere to provide breathable air, no magnetosphere to prevent the carcinogenic effects of cosmic radiation, and gravity too low to maintain human bone density during an extended stay. In December 2018, the Chinese Lunar Exploration Program transported the unmanned 'Lunar Micro Ecosystem' aboard the Chang'e 4 spacecraft to the far side of the Moon. Cottonseeds were successfully germinated inside the 3kg capsule, but the plants died once the lunar evening commenced and the external temperature dropped towards -170°C (Devlin 2019). At 38 million km², the Moon has a surface area slightly less than the Asian continent (Sharp 2017). With significant technological innovation – like caves dug into lunar bedrock and enclosed in protective 'bubbles' – the Moon might have space to live in, but not 'living' space as we know it.

Heading from Earth towards the Sun is the planet Venus. Elon Musk describes its extreme temperatures (averaging 464°C) and atmosphere of 97% carbon dioxide as being "not at all like the goddess" (Musk 2017, p.46). It serves better as a forewarning of potential 'hothouse Earth' climate change scenarios than as a potential site of colonisation (Steffen et al. 2018). Heading from Earth in the other direction is more inviting for NewSpace. Mars is highly appealing to NewSpace due to being "resource rich" and having comparable temperature ranges to Earth and similar land mass to colonise (Musk 2017, p.46). On Mars, temperatures range from -140°C to 20°C, in part due a very thin atmosphere (Faure & Mensing 2007, p.24). According to Musk and many others who have advocated for terraforming Mars, "It is a little cold, but we can warm it up" (Musk 2017, p. 46). Vastly speculative 'terraforming' proposals have been hypothesised to be capable of yielding a breathable atmosphere on Mars (e.g. Sagan 1973). Such a project would require far superior technologies of spaceflight and 'geoengineering' than scientists possess today, and would likely take many thousands of years if it were to succeed at all (considering that the natural evolution of Earth's atmosphere required over a billion years of work from oxygen-producing cyanobacteria). Until then, a healthy Martian colony would be as utterly technologically

⁵⁹ *Project Horizon* (Trudeau 1959), for example, was an Air Force project that proposed an American military installation on the Moon that could house 10-20 people, conduct surveillance of the Earth and defend itself from attack. The report's author Lt. Gen. Arthur Trudeau began cautiously by telling his superiors, "I leave it to your discretion to determine the source and the amount of money to be devoted to this purpose" (Trudeau 1959, preface).

dependent as anywhere else beyond the relatively lower altitudes of Earth's atmosphere.

Beyond Mars lies the asteroid belt, and space mining start-ups' favoured site of resource exploitation. A handful of missions to minor celestial bodies have been completed, only the Japan Aerospace Exploration Agency's 2003-2010 mission to asteroid 25143 Itokawa and NASA's 1999-2006 mission to comet Wild 2 have returned samples. While Mars, the Moon or other large celestial bodies might offer a reasonably straightforward analogy to Earth as planetary 'land', asteroids and comets are very different. Many have very weak gravity, meaning that only low escape velocities would be needed to depart the surface of an asteroid – an attractive prospect if you were hauling ore or water ice to an off-world refinery or smelter. The notion of 'sub-surface' minerals is distorted when spatial referents of 'up' or 'down' are problematised on tiny celestial bodies a few kilometres in diameter. The physicist Freeman Dyson, a friend of Gerard O'Neill, once predicted that "We shall learn to grow trees on comets" and men will one day "take their ease among the tree trunks" (in Carey 1999, p.469). Minor celestial bodies might become sites of mineral appropriation, but recreating an atmosphere on comets and asteroids traversing the vacuums of deep space is of course entirely implausible.

The planets and planetoids beyond the asteroid belt are less promising for NewSpace. Jupiter is the closest celestial body to Earth past the asteroid belt; *Voyager 1* managed a fly-by after 546 days of travel, entering its orbit would require a slower speed and a 2,242-day journey (as per NASA's *Galileo* orbiter). Technical challenges aside, this distance alone would put the outer planets outside the reach of profitable exploitation for the present century (at least), and they subsequently do not feature prominently in the NewSpace imaginary. Outward from Jupiter on the final stops on this tour of the Solar System are the other gas giants Saturn, Uranus, Neptune and their moons, followed by Pluto and Eris, the former recently demoted to the status of 'dwarf planet' or 'trans-Neptunian object', and a host of other planetoids – asteroids, comets and 'centaurs'. Between these celestial bodies are vast expanses of interplanetary space. It is not too bold a prediction to say that human agency in the off-world commons of outer space will be limited to the Solar System, if not the space between Earth and the asteroid belt, for a long time to come.

In lieu of an actualised space mining industry, the only real sites of commercial exploitation in the Solar System are much, much closer to home. The orbital bands stretching from 160km above Earth (below which atmospheric drag will bring any object in orbit back to Earth) and lower than 36,000km from Earth's surface (beyond which human use is mostly limited to scientific research) are sites of advanced scientific, military and commercial

infrastructures. High-earth or geosynchronous orbit (GEO) is particularly valuable. At approximately 35,786km above sea level, inclined directly above the Equator and having an orbital period matching one-day (thus, moving eastward at 11,000km per hour), satellites with these orbital elements will match the Earth's rotation and can thus be positioned above the same place on Earth at a height that affords visibility of 42% of the planet at once (Kelso, cited in Collis 2009, p.47). The allocation of rights to use GEO is governed by the International Telecommunications Union, and is not lawless in the sense that "a satellite's owner must register first with the ITU, which then checks that the slot positioning is acceptable in relation to other satellites, and then assigns that slot and its frequency to the satellite" (Collis 2009, p.2). Yet these quasi-private property arrangements are distinct from the *nomos* of space mining imagined by advocates of NewSpace.

In closing, it is worth emphasising just how difficult it would be to realise the NewSpace colonisation plan. They will "[bring] life to worlds now dead", says the Space Frontier Foundation (in Tumlinson 2003). The International Space Station is in low-Earth orbit – humanity's doorstep to space – and is the furthest extent of sustained human inhabitation on the off-world frontier. It is a symbol of international scientific cooperation (if we ignore the US-led exclusion of the Chinese National Space Administration). As a research facility, the ISS provides insight in microgravity living and scientific and commercial experimentation, albeit at the modest distance of 400km above the Earth's surface. Yet the total mission costs over the ISS's expected 22-year lifespan could approximate US \$150 billion (LaFleur 2010), making it the most expensive public works project ever undertaken – for the seemingly modest task of keeping less than ten people alive in space.

Sustaining a human colony beyond Earth's atmosphere engenders utter dependence on technologies of life support. The spaceship or the space suit represents an existential bubble that shields the human organism and from the outer space environment (Sloterdijk 2013; Walker & Granjou 2017). In *Dialogues on New Space* (2015 [1954]), Schmitt makes some brief observations on outer space. "For me, the human is the son of the earth, and so he shall remain as long as he remains human" (Schmitt 2015, p.81). This statement links both Earth (the home planet) and earth (the soil) as "the mother of all law" (Schmitt 2003, p.42). In *Dialogues*, he remarks on the elemental distinctions between land and sea:

"...the midpoint and core of a terrestrial existence – with all its concrete orders – is the house. House and property, marriage, family and hereditary right, all that is built upon the foundation of a terrestrial mode of being...On the contrary, at the core of a maritime existence there sails

the ship, which is already in itself much more and much more intensely a technological means than the house. The house is rest, the ship is movement. Even the space in which the ship moves is other than the space of the landscape, in which the house stands.” (2015, p.73-74).

The household was the centre of production until the Industrial Revolution. In ancient Greek, the household or *oikos* was primarily an agricultural estate – the verb for governing or organising the estate was *oikonomos* or *oikonomia* (*oikos* + *nomos*), the word from which we derive the modern-day ‘economy’ (Schmitt 2003, p.339; Polanyi 2001, p.55). The very concept of economy thus contains an “immanent measure” related to biological, life-supporting land (Schmitt 2003, p.340), implying that laws of property and sovereignty are “nominally grounded in the lifeways of the common land” (Walker & Johnson 2018, p.59).⁶⁰ Outer space awaits the foundational act of land appropriation that constitutes *nomos*, yet would only ever be *nomos* without *oikos* – a legal order supporting a landless economy.

If, as Schmitt proposed, “the earth is the mother of all law” (Schmitt 2003, p.42), the escape from land is equally an escape from political community and the rule of law. Steinberg, Nyman and Carracioli offer an erudite summation of the Seasteading movement that is equally appropriate for NewSpace (2012, p.1536). Using a quote from the Marxist science fiction writer China Miéville, they describe the ‘lunatic syllogism’ of frontier techno-libertarianism:

“‘I dislike the state: The state is made of land: Therefore I dislike the land.’ Water is a solvent, dissolving ‘political’ (state) power, leaving only ‘economics’ behind” (cited in Steinberg, Nyman & Caraccioli 2012, p.1536).

To depart from the biosphere and shed the bonds of Earth’s gravity is to similarly break with politics and societal obligation.

⁶⁰ In Chapter 3, I will revise Schmitt’s concept of *nomos* in terms of mineral (not land) appropriation.

2.4 Conclusion

Private property is described in NewSpace discourse as a fundamental, individual right, and a beneficial force for universal prosperity. This is a well-worn trope in neoliberal capitalism, one which obscures the actual history of private property in land and natural resources. In the famous words of Sir William Blackstone,

“There is nothing which so generally strikes the imagination, and engages the affections of mankind, as the right of property; or that sole and despotic dominion which one man claims and exercises over the external things of the world, in total exclusion of the right of any other individual in the universe. And yet there are very few that will give themselves the trouble to consider the [origin] and foundation of this right. Pleased as we are with the possession, we seem afraid to look back to the means by which it was acquired, as if fearful of some defect in our title; or at best we rest satisfied with the decision of the laws in our favour, without examining the reason or authority upon which those laws have been built. We think it enough that our title is derived by grant of the former proprietor, by descent from our ancestors, or by the last will and testament of the dying owner; not caring to reflect that...there is no foundation in nature or in natural law [or] why a set of words upon parchment should convey the dominion of land...” (Blackstone 2019, ch.1, s.2).

Blackstone’s evocative description of (private) property as ‘that sole and despotic dominion’ resonates with the NewSpace private property project. If an American space mining firm exercised the rights of private ownership, use and dispossession that are guaranteed under the CSLCA, they would give new weight to Blackstone’s description of private property as the ‘total exclusion of any other individual in the universe’. The CSLCA undermines NewSpace’s humanitarian or cosmopolitan justifications for space mining. State parties to the OST have collectively agreed that the governance of outer space would be guided by principles of free access, equality and community-wide benefits. Yet the CSLCA introduces individual rights to extract from and irreversibly change the space commons. Potential community benefits afforded by celestial bodies and resources would be enclosed from non-spacefaring nations and from future generations.

Yet, as a pre-emptive act of enclosure on a lifeless frontier, the CSLCA is far removed from the enclosures described by More, Blackstone and Polanyi. Polanyi’s description of property in land as a fictitious commodity mirrored Schmitt’s pre-occupation with a telluric understanding of law and order:

“land and labor are not separated; labor forms part of life, land remains part of nature, life and nature form an articulate whole. Land is thus tied up with the organizations of kinship, neighbourhood, craft and creed...” (2001, p.187).

The NewSpace commodification-colonisation project can be read as an attempt at severing the social-ecological ties between land and sovereignty, projecting mythic, ‘self-evident’ property rights onto an abiotic frontier.

We have now discussed the legal foundations of property in land. Yet the CSLCA assigns mining rights, not land title. Schmitt, Polanyi and Locke were concerned primarily with pre-industrial modes of production and took little interest in mining rights. In the 21st century, the ‘enclosure’ of mineral estates similarly involves the devolution from common or public property into private hands. Yet, with industrial pollution threatening all of Earth’s ecosystems and its inhabitants (so much so that NewSpace continues to argue that space mining and colonisation should be considered an important pillar of Earthly environmentalism), there is much more at stake in the enclosure and combustion of mineral commons than the local, agrarian commons of medieval Europe. Whereas property in land rests upon a paradoxical relationship between private freedom and politico-legal power, the history of mining rights involves a different entanglement of state sovereignty and private property – which we will explore in the following chapter.

3. On mineral sovereignty: state-corporate appropriation and undemocratic law-making⁶¹

Through the *Commercial Space Launch Competitiveness Act (CSLCA)*, the United States has established a legal framework of private property rights in anticipation of private claims to space resources. The sovereign's ability to confer rights of property ownership upon their citizens cannot be explained without a history of constitutional laws of property in land. However, enclosing the 'mineral commons' (on Earth and in space) is different to enclosing the lifeways of landed community. What is the difference between private property in minerals and property in land? How do we theorise the relationship between the state and markets vis-à-vis mining law? What parallels can we draw between the private appropriation of mineral wealth in outer space and what has come before on Earth?

Property in land emerged from the reliance of humans upon their land for subsistence. Property rights in minerals emerged more recently, beginning in the 16th-17th centuries and accelerating alongside industrial capitalism and the reliance of states upon metals, ores and combustible fossil fuels in order to administer the national economy and compete in international trade and war. Whereas villagers, serfs and rural wage labourers tended the land, the scale and complexity of enclosing mineral commons involves the delegation of authority to mine to parties who have the requisite skills and capital to do so (Walker & Johnson 2018, pp.59-60). In relation to minerals, we speak instead of mineral 'estates' or 'commonwealths'. 'Commonwealth' "literally means common property or riches", but the distinctions between communal, public and private property in minerals are often unclear (Flomenhoft 2018, p.1). Flomenhoft notes that constitutional law may assign ownership of minerals within a territory to 'the people', yet in practice mineral commonwealths are more often administered by national government and exploited by incorporated entities (2018, p.11-12). In his comparative study of 199 nations, Flomenhoft determined that the state or crown retained ownership of minerals in 142 nations (ibid, p.11).

For the majority of human history, rights to own and use the land engendered modes of production and consumption that were predicated on cultivation, stewardship and

⁶¹ This chapter has been modified from a publication co-authored by myself and my Principal Supervisor, Dr Jeremy Walker (see Walker, J. & Johnson, M. 2018, 'On mineral sovereignty: towards a political theory of geological power', *Energy Research and Social Science*, vol.45, pp.56-66). It is re-printed here with permission of Dr Walker and Dr Benjamin Sovacool, editor of *Energy Research and Social Science*. My contributions to that paper are uncited in this chapter, while those of Dr Walker are cited either as direct quotations or paraphrased as in-text references. Section 3.3 is my own unpublished work.

inheritance (to varying extents). It is no good over-exploiting your land if you and your heirs will have to live on it. Mineral rights, however, are extractive rights: a party is granted access, they take what minerals are profitable and then move on to the next reserve. Dahlin and Fredriksson describe ‘extractivism’ as a fundamentally colonial practice, where “both the resource and the profit it generates tend to be exported” (2017, p.255). Resources are ‘unbundled’ from their context (an oil reservoir, for example), and transported elsewhere such that they can threaten other commons (a marine estuary or the atmosphere, among others) that are distant from the initial act of extraction and enclosure (Dahlin & Fredriksson 2017, p.264).

The stakes are thus higher in the enclosure of terrestrial mineral commonwealths than in the agricultural enclosures we explored in the previous chapter. If left unchecked, the carbon intensive extraction of minerals and the combustion of fossil fuels constitute nothing less than an existential threat to all life on Earth. The realisation that we lived in an age of ‘the Anthropocene’ – whereby humanity itself represents the supreme geological force and the present geological epoch is characterised by the wholesale exercise of this force – was arrived at much earlier than O’Neill or the Club of Rome, and indeed much earlier than Paul Crutzen’s (2002) proclamation of an Anthropocene epoch. Vladimir Vernadsky (1863-1945) was a Russian mineralogist, biochemist and, with NewSpace precursor Konstantin Tsiolkovsky, a philosopher in the cosmist tradition. Vernadsky is widely considered the founder of Earth systems science, and was one of the first to articulate what would become the essence of the Anthropocene thesis:

“... in our geologic era ... – the era of reason – a new geochemical factor of paramount importance appears...Man has introduced into the planet’s structure a new form of effect upon the exchange of atoms between living matter and inert matter...With man, an enormous geological power has appeared on the surface of the planet” (Vernadsky [1924], in Guillaume 2014, p.138).

Vernadsky coined the term ‘biosphere’ (1926) and described the ancient, solar-bio-energetic processes which human industry was now exploiting (Walker & Johnson 2018, p.56). He stated that humankind “does not transcend the bounds of living nature, since the primary source of the electrical and steam energy [driving civilisation] is that same living matter or...past living organisms which have transformed through geological processes” – namely, coal and oil (Vernadsky 2012 [1938], p. 27). Techno-scientific, thermo-industrial civilisation transforms ever more of the Earth into ‘the economy’ and has fundamentally altered the

biogeochemical structure of the Earth's enveloping spheres in this process – biosphere, atmosphere, hydrosphere and cryosphere (Walker & Johnson 2018, p.57). Were space mining to materialise, human dominion over nature would extend into the off-world, reaching 'exo-geological' proportions.

However, as Malm and Hornborg (2014) have noted, the concept of the Anthropocene is not easily transferable into the social sciences. In the Anthropocene narrative, it is the abstraction of 'humanity' that wields geological power. Responsibility for the exercise and consequence of geological power are diffused across the 'species', which effectively de-politicises our understanding of the Anthropocene (Malm & Hornborg 2014; Walker & Johnson 2018, p.57). Geological power is clearly unevenly distributed, whether we consider disparities in fossil fuel combustion between developed and developing nations or the disproportionate influence of mining interests on climate policy. In the US refusal to sign the *Moon Agreement* (1979) or indeed the passage of the CSLCA, we can see that anticipatory, exo-geological power is similarly concentrated in the developed world and wielded by neoliberal actors.

In the nascent space mining industry, Silicon Valley, aerospace manufacturing and the resources sector become curious bedfellows. The delicate, lightweight construction of spacecraft seems far removed from Earthly extractivism. Mountaintop removal, earthmovers, bucket-wheel excavators and 200-wagon coal trains – the sheer scale and destructiveness of the contemporary resources industry stands in contrast to the intricacies and fragility of aerospace innovation. This contrast is heightened when we consider that many of the venture capitalists and 'angel investors' funding space mining have made their fortunes in the fetishised (Marx 2015) and disembodied 'creative' or 'knowledge' industries – an incorporeal economy seemingly at odds with terrestrial mining's capacity to irreversibly alter the material world. Yet these personal fortunes from ICT entrepreneurialism – whether Musk, Page, Bezos or Thiel – require geological power, in the form of copper phone lines, tantalum capacitors and lithium-ion batteries, to name but a few minerals upon which both the 'knowledge' and NewSpace economies are dependent.

In this chapter, I develop the term 'mineral sovereignty' – introduced previously in a co-authored article (Walker & Johnson 2018) – as a means to analyse how geological power becomes geological agency, "where agency refers to the political capacity of specific social subjects to act intentionally, perhaps against the will, interests or rights-claims of others" (p.57). I will argue that the category 'sovereignty' – one of the most basic concepts in political theory – is lacking a grounding in the politics of the subterranean. Mineral

sovereignty is a hybrid term that denotes the “general politico-legal field of the extractive, pyrotechnical, and metallurgical industries” (p.57). It describes the co-constitutive powers of state and corporation that are manifest in mineral rights, that I argue are now being projected off-world through the CSLCA. Mineral sovereignty is evident in “the formal state power to confer legality and legitimacy upon mining operations” (p.57). As a term of historical method, mineral sovereignty underscores the implausibility of demarcating acts of private appropriation from claims of national sovereignty, and thus it further highlights how the CSLCA is incommensurable with the terms of the *Outer Space Treaty* (OST).

However, ‘mineral sovereignty’ problematises an understanding of law as an objective ‘thing’. It points to the question of power – for mineral sovereignty can also be extra-parliamentary, “evident in the historical capacity of mining capitals to shape the political environment and legal architectures of the territories they operate in, including state capture, ‘regime change’ or transgression of international law” (p.57). The CSLCA re-animates what I will argue is a deep historical relationship between state power and extractive rights. We can attribute the passage of the CSLCA to the lobbying of space mining start-up Planetary Resources. NewSpace actors have claimed that their project is about ‘democratising’ outer space (e.g. Lubin, in Planetary Resource 2018; see also Rocket Lab’s Robert Beck, cited in Shammass & Holen 2019, p.3). The age of the space bureaucrat and the public servant astronaut is over, they claim, for it is “the people [who] have ‘the right stuff’” (Tumlinson, in *Orphans of Apollo* 2008).⁶² In keeping with American frontier exceptionalism, NewSpace treats outer space as a site of political renewal and reinvention (e.g. Zubrin 1994; ASD 2019, p.3). However, the role of corporate lobbying in the passage of the CSLCA suggests that ‘NewSpace democracy’ deserves closer scrutiny. As a case study in mineral sovereignty, I trace the passage of the CSLCA using Congressional records (e.g. U.S. House of Representatives 2015a) and the Centre for Responsive Politics’ (CRP) database of federal campaign contributions and lobbying activity, the latter collated from the Senate Office of Public Records (e.g. CRP 2018a). I will demonstrate how the private property guarantees of this legislation became public law through a process that is discordant with

⁶² To reiterate a point from the previous chapter, NewSpace advocates deploy a Lockean conception of constitutional democracy founded on private property rights, which they meld with a cosmopolitan imaginary of the human species and its eternal prosperity. For example, the National Space Society (which traces its lineage to the O’Neill inspired L-5 Society) has a ‘Statement of Philosophy’ which says, “space development and settlement will occur most efficiently, and humanity’s survival and growth will be best ensured, if every human being is allowed the opportunity to own property in space”, and “if the fundamentals of democracy are applied to and incorporated by space settlements” (NSS 2019).

Abraham Lincoln's famed edict that democratic government should be 'of the people, by the people and for the people'.

3.1 Rethinking sovereignty

For the CSLCA to be commensurate with the principles of the OST, space miners claim that they can appropriate minerals from celestial bodies without there being any territorial or sovereign claim of the United States embedded within these acts of private appropriation (e.g. Kfir 2016). The exercise of sovereignty in outer space has precedents in spacefaring history, albeit generally confined to governments' jurisdiction over their own spacecraft and astronauts – this is distinct from the exercise of jurisdiction over mineral resources as it has occurred in capitalist history. What would 'state sovereignty in space' mean, if it was applied through the permanence of industrial extractivism and the political and technological infrastructures that come with it? Moreover, what does 'sovereignty' actually mean, when we consider this Earthly mining history?

Space law scholars have noted that "sovereignty is very limited in outer space" (Masson-Zwaan and Palkoitz 2017, p.8). Article 8 of the OST states that a "State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such an object, and over any personnel thereof, while in outer space or on a celestial body" (OST 1967) – much like the way in which colonial seafaring vessels brought the laws of their motherland with them, the Empire was contained and floating upon the high seas like a piece of 'moving territory' (Heller-Roazen 2009, p.180). Perry notes that the CSLCA has avoided discussing this 'active personality' concept, but leaves the question open as to whether the extra-territorial mining rights of the CSLCA represent an permissible extension of the state's ability to "assert sovereignty over its nationals even when its nationals are outside the country" (2017, p.9). Hobe and de Man also interrogate this point from a space law perspective, but conclude that the active personality principle does not mean "that a State can regulate...the status of this [extra-territorial] environment itself" – such as by exercising state powers to effectively change the status of off-world mineral resources to being ownable as private property (2017, p.468).

In space and on Earth, 'sovereignty' is a contested term – particularly when we look to its application in the field of mining. Sovereignty is "among the most basic and controversial of concepts in political theory and international law", yet most conventional

narratives of sovereignty lack a sense of materiality beyond two-dimensional, cartographic understandings of territory (Walker & Johnson 2018, p.58). “Sovereignty is the authority manifest in the powers of decision and coercion which order a given territory, binding the rulers with the ruled in a political community” (p.58). A conventional genealogy of sovereignty might start with Ernst Kantorowicz’s (1957) *The King’s Two Bodies*. Kantorowicz described how the concept of the King’s body gradually fused with ‘the Kingdom’, leading to the modern understanding of the ‘body politic’ (Kantorowicz 1957). In medieval monarchy, the ‘sovereign’ connoted both the power to rule and the ruler herself; the modern body politic represented “an authority that was bundled into a single entity”, which “held supremacy in advancing the interests of the polity” and was “confined within territorial borders” (Philpott 2014, p.2). ‘Popular sovereignty’ emerged from democratic revolutions in England, France and America which gave the power to decide on rulers to the *demos*. Enlightenment philosophers like Thomas Hobbes, John Locke and Jean-Jacques Rousseau developed social contract theories of sovereignty, where (to varying degrees) it was argued that the legitimacy of government authority and the rule of law ought to be grounded in the consent of the governed.

The French jurist Jean Bodin (1530-1596) is credited with the earliest secular theory of the state, in which he also noted the ambiguities in sovereignty. In his *The Six Books of the Commonwealth* (1967 [1576]), Bodin said:

“The first attribute of the sovereign prince ...is the power to make law binding on all his subjects in general and on each in particular. But to avoid any ambiguity one must add that he does so without the consent of any superior, equal, or inferior being necessary. If the prince can only make law with the consent of a superior he is a subject; if of an equal he shares his sovereignty; if of an inferior, whether it be a council of magnates or the people, it is not he who is sovereign.” (Book 1, Chapter 10, p.42)

On the one hand, sovereignty is that power that gives law its authority, force and legitimacy in a given nation and territory, binding and constituting the rulers and ruled as a political community (Walker & Johnson 2018, p.58). On the other, sovereignty is that power presumed to be constrained by constitutional limitations upon executive authority – such as the separation of powers under the American Constitution, or its provisions against the expropriation of private property. Yet the sovereign power is revealed most clearly when the declaration of an exceptional threat to security justifies the *suspension* of these constitutional and juridical norms (Schmitt 1985; Walker & Johnson 2018, p.58). To use Carl Schmitt’s

phrase, which Hitler put into practice in assuming dictatorial powers, “Sovereign is he who decides on the exception” (Schmitt 1985, p.5). The aftermath of September 11 offers a contemporary example of the constitutional power to suspend the constitution, in which the fortification of the surveillance state and abrogation of citizens’ freedoms has been justified with discourses of ‘national emergency’.

The concept of sovereignty also appears ambiguous when viewed through the prism of neoliberal globalisation. In an increasingly interconnected world of trans-boundary capital flows and movements of goods, services and people, the political unit of the nation state is thought to be de-territorialised, its sovereignty diminished. Luxembourg has been described as a tax haven which “sold its sovereignty” to the global financial industry (Zucman, in Abrahamian 2017). Its *Space Resources Act* (2017, Art.4) allows foreign companies to register ownership of appropriated space resources, so long as they have an office in Luxembourg – a ‘flag of convenience’ much like registering a shipping company in Panama. Luxembourgian space resources law involves an exercise of sovereignty that supports the political and economic goals of *foreign* sovereigns and empowered elites, by removing ‘borders’ for transnational movements of capital. ‘Off-shore’ tax jurisdictions such as Luxembourg illustrate how neoliberal globalisation and the global ‘race to the bottom’ on national economic policy can obfuscate the exercise of state sovereignty.

Meanwhile, neoliberal and neoclassical economic theories hold that the power of the sovereign decision is diffused into ‘the market’ – a spontaneous aggregator of the countless instances of free choice exercised by supposedly rational, autonomous individuals. ‘Consumer sovereignty’ was a theory proposed by William Harold Hutt, a neoclassical economist and Mont Pèlerin Society member. He framed sovereignty within the ‘laws’ of supply and demand, claiming that the “ultimate power” in an economy was the consumer, and the producer was ultimately subject to their ‘demands’ (Hutt, in Egger 1994, p.113). Hutt’s consumer sovereignty theory evades the question of ‘producer sovereignty’ that is so ubiquitous in neoliberal capitalism: the countervailing power of large corporations “to serve their own goals” often by capturing the state – the “power that is inherent in institutional position”, to use Galbraith’s formulation (1970, p.475). Yet even Galbraith’s critique of ‘consumer sovereignty’ serves to illustrate the absence of materiality in standard theories of sovereignty.

Clearly, there is a mineral aspect to the question of sovereignty: whether accessing metals to build the technologies of war or securing fossil fuel reserves to power national industry, geological power is the taproot of military and economic power. As Stuart Elden

(2013) observes, customary understandings of territorial power are well-expressed in the military command to ‘secure the area’: a cartographic view of land and territory as a flat space. Sovereignty, understood in this sense, underplays the imperative to secure strategic 3-dimensional spaces, or ‘volumes’, to think of “height and depth instead of surfaces, three dimensions instead of areas” (Elden 2013, p.35). It is surely vital to political accounting to estimate the volume of oil and gas in the mineral estate, and to wield ‘vertical power’ over geological strata. “Whether state-owned or state-owning, it is often the most vertically consolidated of corporations running the business of mining” (Walker & Johnson 2018, p.58).

In this sense, the control of mineral wealth can be said to be constitutive of the political. “From the police cell to the presidential palace, the conditions of energy exploitation frequently translate into the political conditions of the nation as whole, and in turn its regional and international relations. Angola, Azerbaijan, Bahrain, Bolivia, Chechnya, Congo, East Timor... Saudi Arabia, Venezuela, West Papua. We need not list more nations where mineral extraction and the distribution of resource rents are key factors in exceptional histories of revolution or counter-revolutions of constitutional order” (Walker & Johnson 2018, p.58-59). This is also true of ‘politically stable’ jurisdictions like Australia, Canada and the United States, where governments are frequently unable (or unwilling) to reign in the ambitions of fossil capital. National government often appears as the executive arm of mining capital, legislating for ‘energy security’ and against movements for carbon taxation, renewable energy, Indigenous land rights or environmental protection.

We thus need to revise our understanding of ‘sovereignty’ by returning to the question of how law relates to the base materiality of planet Earth – *nomos*. Schmitt’s (2003) account of terrestrial order began with the following statement on the primacy of land in *all* law and order, not just that explicitly concerning title in land and natural resources. For Schmitt, the earth, ‘the soil’, is “the mother of law”:

“...the earth is bound to law in three ways. She contains law within herself, as a reward of labor; she manifests law upon herself, as fixed boundaries; and she sustains law above herself, as a public sign of order. Law is bound to the earth and related to the earth (2003, p.42).

In the pre-industrial legal traditions I discussed in Chapter 2, rights to land, soil, water and other life-sustaining resources are “nominally framed as social obligations to the common interest in land and food production” (Walker & Johnson 2018, p.59). Yet the administration of the modern industrial order – dependent on minerals ranging from gold to coal to copper

and tantalum – cannot be understood in terms of attachments to the soil.

In light of the significance of sovereign claims to the *sub-soil*, let us revisit Schmitt's claim that "land appropriation [is] the primeval act of founding law, [the] terrestrial fundament" from which both the dominium of private law and the imperium of political authority are derived (2003, p.45-47). Schmitt's statement that "the constitutive process of a land-appropriation is found at the beginning of the history of every settled people, every commonwealth, every empire" could be equally valid in terms of mineral appropriation (2003, p.48). As I will demonstrate in the following section, mineral appropriation is a process constitutive of nation and empire. This further emphasises that the NewSpace utopia is an anticipatory extension of state sovereignty and national powers of appropriation, rather than a libertarian transcendence of it. Mineral appropriation (rather than land appropriation) under the terms of the CSLCA may become the founding act of a neoliberal *nomos* of outer space. One possibility is that off-world mining corporations themselves become nation states, making laws and protecting their property on the off-world frontier as they see fit. At the very least, a mineralised conception of sovereignty suggests that any dichotomy between 'national' and 'private' acts of appropriation is highly problematic.

3.2 A brief history of mineral sovereignty

'Sovereign is she who decides the state of extraction'... "who decides the access rights, labour conditions, and revenue obligations of mining concessions, and responsibility for the consequences of pollution" (Walker & Johnson 2018, p.58). The history of mineral sovereignty reveals an entwined genealogy of the public laws of empire and nation-state, and the private law of mineral rights, where distinctions between the formal political power of government and the economic power of transboundary corporations cannot be presumed (p.57). In this section, I will explore mineral sovereignty in three eras: the formation of the industrial state and empire in the age of 'royal metals'; the nationalisation and democratisation of mineral exploitation in the 19th-20th centuries; and the rise of neoliberalism as a movement re-privatising mineral sovereignty. Each of these case studies offers some insight into how mineral sovereignty may materialise in outer space.

3.2.1 Royal metals: mineral sovereignty and empire

Cuius est solum, eius est usque ad coelum et ad inferos. According to this Latin maxim dating to the 13th century, “the owner of the soil has a prima facie ownership of everything reaching up to the very heavens and down to the depths of the earth” (Gray, 1991, p.253). The *ad coelum* doctrine would be enshrined in English legal commentary by Sir William Blackstone in the 18th century.

“Land hath also, in its legal signification, an indefinite extent, upwards as well as downwards... whatever is in a direct line, between the surface of any land and the centre of the earth, belongs to the owner of the surface; as is every day’s experience in the mining countries. So that the word ‘land’ includes not only the face of the earth, but every thing under it, or over it” (2019, ch.2, para.18).

In the 20th century, access to airspace and outer space would place upper limits on the *ad coelum* understanding of property rights as vertically extendable. Yet the *ad coelum* doctrine remained influential in American mining law into the 20th century, in select jurisdictions. Some states allow landowners to claim select minerals beneath their properties (fossil fuels often being a notable exception) and ultimate title is not vested in state or federal government (Flomenhoft 2018, p.5). Defences of the CSLCA represents a distortion of the *ad coelum* principle, where mineral rights can be possessed by individual owners without ultimate title resting in state sovereignty *and* without there being any private ownership of the surface ‘land’.

“Long before the legal revolutions that would abolish feudal titles and establish markets in land as exclusive private property, there were sovereign exceptions to landholders’ rights in the subterranean” (Walker & Johnson 2018, p.60). Flomenhoft notes that ancient Roman law “established the rights of mineral to states” (2018, p.5). John Nef describes the *Regale*, the claim of the sovereign to authority over land bearing precious metals (1964, p.16). Frederic Barbarossa (1155-1189) claimed the regale as an attribute of his imperial sovereignty, and pressed claims for a share of all gold and silver mines in the Holy Roman Empire. In many jurisdictions the right of the overlord to claim ownership over metals was to become supreme over the rights of the manorial ‘lords of the soil’. Sovereign claims to ‘royal metals’ of gold and silver surpassed feudal rights to collect agricultural rents and enjoy usufructuary privileges. “But in practice this required negotiation and the delegation of authority: rents, or ‘royalties’ could not be set so high as to discourage industrial activity that

royals themselves were not interested in doing” (Walker & Johnson 2018, p.60).

There are only brief and isolated examples of what can be called ‘free mining’. In ancient Rome most mining was performed by slaves. By contrast, medieval mining involved relatively autonomous companies of highly skilled miners, with their own charters, rights and privileges often greater than those of towns emerging around textiles and other non-metal manufactures (p.60). In England, the charter of the ancient demesne Forest of Dean enabled common rights to exploit minerals, “whereby men who were born in the [administrative division] of St Briavels and who have worked in mines for a year and a day, have the right to exploit coal and iron ore” (Foundation for Common Land 2016). In Germany, where the techniques of mining and metallurgy were most advanced, the word for ‘mountaineer’ and ‘miner’ was the same (Nef 1964). “Envied by serfs bound to labour for the ‘lord of the soil’, the miners travelled to wild places, seeking exposed surface ores of silver, copper, gold, iron, and abundant forests to cut for fuelwood and charcoal for small-scale open-air smelting” (Walker & Johnson 2018, p.60). Patterns of ‘settlement’ in Europe owed much to the migrations of German miners: “The movement to colonize and to mine went hand in hand” (Nef 1964, p.12). Lewin notes how gold mining in western American states in the 19th century similarly involved settlements of ‘free miners’, “who looked to themselves for the drafting of laws that would suit them best” (1931, p.247). NewSpace actors also hope that off-world colonisation will also be propelled by free companies of adventurous miners. These romanticised analogies with the early pioneers (Launius 2003, p.343), however, stand in contrast to the speculative technoscience, government support and private capital required for their project to have any chance of succeeding.

‘Free mining’ is an isolated form of mineral ownership and exploitation, because the development of mining, metallurgy and associated pyro-technologies (smelting, coal combustion, the steam engine and so on) became closely related to the emergence of core institutions of capitalism and the development of the nation-state. As the scale of production increased, mining works became less *ad hoc*, more capital intensive and less mobile. “The financing of larger and more permanent smelting and battery works, and of deeper mines deploying grander drainage and ventilation systems, demanded ever larger sums and combinations of investors” (Walker & Johnson 2018, p.60). Nef (1964) links the evolution of mining technologies to the emergence of specifically capitalist forms of industry, predicated on the division between capital and labour. Shares in mining companies were once held by and exchanged between miners themselves (Nef 1964, p.17). Eventually, the ownership and management of mines were transferred to more powerful players, such as

wealthy absentee owners, a class of professional mine managers and royal revenue collectors. “The miners themselves were increasingly cheapened to wage labourers with no rights in their product or share in the profits” (Walker & Johnson 2018, p.60).

Mining also became essential to monetary sovereignty and, by extension, modern state formation. *Regalian* rights to mineral ownership were closely related to regal privileges to mint, to be the sole coiner of currency, and thus to administration of the treasury and the management of national economy (ibid, p.60). While Blackstone’s influential *Commentaries* had enshrined the *ad coelum* doctrine in English common law, Lewin notes that “Blackstone upheld the King’s prerogative right” to claim minerals “for the coinage of money and to promote commerce” (1931, p.345). English monarchs would reassert their *regalian* rights in the 1556 ‘Case of Mines’ (*R v Earl of Northumberland*), in which the Court decided in favour of the Crown, Elizabeth I, stating that:

“by the law all mines of gold and silver within the realm, whether they be in the lands of the Queen, or of subjects, belong to the Queen by prerogative, with liberty to dig and carry away the ores thereof, and with other such incidents thereto as are necessary to be used for the getting of the ore” (cited in Colman 2010).

In the wake of the Case of Mines decision, the Crown extended its dominion over metals by establishing royal monopoly through two charter companies: the Society of Mines Royal and the Company of Mineral and Battery Works. Much like the Germanic miner-colonisers described by Nef, the granting of letters-patent to skilled miners aimed to benefit the imperial economy, developing productive industry while raising revenue through the collection of rents (Hyde Price 1906, pp.14-16).

Mineral rights were frequently delegated to privateers, joint-stock companies and corporations – privately owned, for-profit extensions of the sovereignty of the Crown, the vanguard of world Empire. The organisation of corporate forms of private property, risk bearing, joint-stock capital and mercantile enterprise also emerged through the royal charter companies. Whereas the above letters patent would codify forms of mineral sovereignty in England, charters with privateers and companies would extend royal claims to precious metals into the New World. For example, Elizabeth’s charter for the exploration of Virginia, granted to the privateer Walter Raleigh, would grant the right to “holde, occupie, and enjoye to him, his heires and assignes, and euery of them for euer, all the soile of all such lands,

territories, and Countreys, so to bee discovered and possessed [sic]” (in Thorpe 1909, p.54).⁶³
But as for royal minerals, the Crown would:

“[reserve] always to us our heires, and successors, for all seruices, duties, and demaundes, the fift part of all the oare of golde and siluer, that from time to time, and at all times after such discouerie, subduing and possessing, shal be there gotten and obtained” (in Thorpe 1909, p.54).

With the colonial conquest of the New World and Asia, mineral rights became a political-economic institution that traversed and irreversibly changed the Earth. The English gold sovereign coin is an apt illustration of the combined powers of mineral and state sovereignty: stamped with the face of the sovereign monarch, it embodied the undivided claim of the sovereign state to be the sole issuer of currency, to tax, make law, declare war, and extend Crown control into new territories.

The colonial expansion of European mineral sovereignty offers some parallels with the provisions of the CSLCA. The CSLCA can be read as a neoliberal ‘letters patent’ to the American space mining industry. “The President, acting through appropriate Federal agencies, shall...discourage government barriers to the development in the United States of economically viable, safe and stable industries for...commercial recovery of space resources” (CSLCA 2015, s.51302). In the name of national industry and economic growth, the sovereign delegates to the market the authority to mine the ‘high frontier’. Lunar helium-3 or asteroidal platinum may or may not become as vital to the energy and resource security of the US in the same manner as oil or gold.

Yet, reminiscent of maritime empires past, it appears the US is pre-emptively extending a sovereign claim to the mineral resources of the Solar System, asserting jurisdiction over minerals through the arms-length entity of the merchant corporation or, in this case, the start-up company. Instead of the privateer or the charter company, NewSpace libertarianism has evoked another figure from maritime colonialism – the pirate (in *Orphans*

⁶³ Sovereignty over gold and silver was not limited to the British Empire, of course. Focusing on the Potosí silver mine of Peru, Moore (2010) describes how the violent exploitation of New World silver by the Spanish Empire in the 16th century would radically transform the social-ecological systems of the Americas, accelerating the development of the broader capitalist world-system. Silver inflows from the Americas become a vital stream of income for the Spanish Crown, ultimately leading to imperial decline through a protracted period of agricultural crisis, inflation and rising national debt. American silver was also vital in maintaining monetary-stocks and money-capital formation across Europe (Moore 2010, pp.64-65, p.59). Potosí silver would become the cash-basis for the Dutch Republic and its East India Company, providing the momentum for multiple European sovereigns’ dominion over ever larger expanses of territory.

of *Apollo 2008*).⁶⁴ There is an irony that, under the auspices of the CSLCA, the space mining project actually extends national sovereignty into frontier spaces through the state-sanctioned appropriation of mineral resources. Without this legal guarantee, no private business would anticipate investing in mining the space frontier.

3.2.2 *The social democratic taming of mineral sovereignty*

Conflicts over the exploitation of mineral resources and distribution of mineral wealth are central to geopolitical history. In particular, the development of global commodity chains of carbon-based mineral energy brought with it sites of struggle, contestation, class-compromise and violence, both within the territorial space of established industrial powers and in the colonial frontiers of imperial expansion. Mineral sovereignty was tamed, in places, in order to meet the needs of the *demos* and the social democratic welfare state. What benefits could be derived from off-world mining if it were similarly directed towards universal human welfare?

In the 19th century, Friedrich Engels had seen the debilitating conditions in which English coal miners worked for wages below levels of subsistence. He said, “this is not the steerage of an American slave ship, it is the dwelling of freeborn Britons!”, implying the dominion of mineral sovereignty over life and labour (1998 [1887]). Yet new forms of economic, social and labour organisation emerged alongside coal-fired industry that facilitated key political movements in the late 19th and early 20th centuries. In his influential ‘carbon democracy’ thesis, Timothy Mitchell describes how coal-fired steam and electricity lead to mass urbanisation and the proliferation of manufacturing firms, which lead to an unheralded concentration of labour in cities – this, in turn, facilitated the organisation of labour movements and unionisation (2009). The infrastructure of coal distribution, most commonly through railroads, meant that large volumes of vital carbon energy flowed through narrow channels – chokepoints that could be disrupted through industrial action (Mitchell 2009, p.403).

Mitchell’s ‘carbon democracy’ thesis illustrates that, with the support of democratic institutions, mineral sovereignty can be domesticated and made to serve broader social interests. Coalminers in Germany, Britain, Australia and the US went on strike frequently, prompting labour reforms and welfare state demands at the turn of the century. From the bowels of coal mines emerged nascent forms of electoral democracy and the welfare state.

⁶⁴ This case study in NewSpace mythology will be discussed in Chapter 5.

English miners achieved numerous class compromises, such as the reduction in hours in a working day and the prohibition of child mine workers. Half a century later, Keynesian governments in the West and anti-colonial nationalists in the developing world sought to nationalise resource industries and tax resource rents for social distribution. For example, the British Labour Party had deposed Winston Churchill in the 1945 election. The new Prime Minister, Clement Atlee, had funded expansive welfare state reforms through the nationalisation of the coal and steel industries, in addition to rail and electricity infrastructure (Walker & Johnson 2018, p.61).

Could space mining be guided towards similar social democratic ends, if it ever eventuated? The terms of the *Outer Space Treaty* state that the “exploration and use of outer space...shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development” (1967, Art. 1). This article of the Treaty offers less precision than, say, the Vietnamese Constitution, which declares that minerals are “public properties, coming under ownership by the entire people represented and uniformly managed by the State” (in Flomenhoft 2018, p.11). However, the Treaty’s declaration that the use of outer space should be for universal benefit could be interpreted in more concrete, social democratic terms.

One possibility is the development of an international mechanism for the equitable distribution of taxes collected on off-world mining profits or super-profits. If space mining becomes as profitable as some estimates have suggested it might (e.g. Goldman Sachs, in Edwards 2017), then a redistribution of resource rents could be of significant value for nations and peoples unable to access space. Levine proposes a social democratic space mining policy: a ‘Galactic Wealth Fund’ “to manage the proceeds of outer space resources on behalf of all human beings” (2015). Levine’s proposal is similar in concept to sovereign wealth funds, such as the Norwegian Government Pension Fund, which has over US \$1 trillion in funds deriving from the nation’s oil and gas revenue. In lieu of an equivalent fund in international governance institutions, Levine draws parallels between his proposal and the Alaska Permanent Fund, which distributes an annual US \$1-2000 dividend in oil royalties to Alaskan residents (Levine 2015; Flomenhoft 2018, p.10). Levine believes the galactic version could be managed collectively “beyond the traditional confines of the nation state” and this fund could “provide the basis for a truly universal basic income” (Levine 2015). Idealistic as it may be, there would be a sense of justice in a sovereign wealth fund that provided universal basic income across the globe by distributing rents from space mining. Automation and the development of artificial intelligences are likely to be a substantial driver of unemployment

in the decades ahead – many innovations in AI are being developed by the same investors currently financing space mining start-ups (Larry Page and Peter Thiel, for example).

However, the terrestrial history of how mining capital has typically responded to social democratic reform should instead give us cause for pessimism. Mitchell's (2009) account also describes the extent to which the interests of transnational fossil fuel corporations have been protected through regime change – victories for carbon despotism over popular sovereignty. Oil is perhaps the clearest case study in the link between mineral sovereignty and violent, interventionist foreign policy – a neo-colonialism in which developing countries' sovereignty over natural resources is undermined by more powerful state-corporate partnerships.

Both Mitchell and Christopher Doran (2012) have noted how US and UK foreign policy has not only involved securing particular mineral reserves or supply chains, but also the protection of international trade monopolies and the hegemony of the US dollar in the global oil market. One example (which brings us back to the nascent space mining industry) is the Trans-Arabian Pipeline, in which we can see Western oil corporations and despotic client government colluding to control resource markets. The use of post-war Marshall Plan funds for construction of oil transportation facilities in the Middle East was a direct response to the militancy of European coal miners (Mitchell 2009, p.406). This formed part of a geopolitical strategy to shift Europe's energy consumption toward oil-based sources, favouring Anglo-American oil corporations and reducing the influence of industrial unions in European political economy. As I discussed earlier (section 1.2.2), this included the US-Saudi push for the post-OAPEC embargo agreements that assured oil sales would be conducted in US dollars.

The 'Tapline' extends from the oilfields of Saudi Arabia to the Mediterranean via northern Syria. The Trans-Arabian Oil Company (a partnership between Exxon, Chevron, Texaco and Mobil) enjoyed monopoly concessions and royalty free operations in neighbouring Palestine. When the Syrian parliament proved uncooperative in their negotiations with the Company, "the CIA [organized] a coup to put a more accommodating colonel in power" and the military government of Husni al-Za'im "suspended parliament and the constitution and completed the pipeline agreement" in May 1949 (Mitchell 2009, p.411). 'Sovereign are they who decide the state of extraction' (Walker & Johnson 2018). The Tapline and its journey through Syria required the legal-political institutions of a newly independent state being suspended in the service of US oil multinationals and a US economy increasingly dependent on oil consumption and trade.

The Tapline was constructed by the Bechtel Corporation, the world's largest engineering firm. In 2013, asteroid mining start-up Planetary Resources announced a strategic partnership with Bechtel (Planetary Resources 2013a). Riley Bechtel, the company's billionaire CEO and a Republican ally, said of the new partnership: "Our companies share a common vision to innovate and push boundaries, all aimed at contributing to a better quality of life" (in Planetary Resources 2013a). Bechtel are certainly familiar with pushing boundaries and securing 'volumes' (Elden 2013), but we need to dispute their contributions to the global 'quality of life'. Among other forays into resource imperialism, Bechtel received a no-bid contract worth over \$2 billion from USAID in 2003 for the rebuilding of Iraqi infrastructure after the US invasion, in spite of past collaborations with Saddam Hussein's government (Doran 2012, p.158).

Bechtel also collaborated with militias in the Democratic Republic of Congo who were fighting for control of the region's coltan reserves. Coltan is a mineral composed of columbium and tantalum, the latter element being central to the production of tantalum capacitors. The Congo- Zaïre region is plagued by the 'resource curse', as it possesses the largest coltan reserves in the world (Montague 2002). This is where we see a connection between Earthly resource conflict and the race for the high frontier. Dena Montague (2002) describes the global supply chain of this essential component in the global electronics and aerospace industries (key pillars of NewSpace investment). Montague notes how Bechtel had purchased NASA satellite studies that provided both infra-red data on the region's mineral reserves and military intelligence that assisted the invading Alliance des Forces Démocratiques pour la Libération du Congo-Zaïre in suppressing local uprisings (Montague 2002, p.110). We will return to Planetary Resources and mineral sovereignty in section 3.3 below. Here, I will underline that the most influential of space mining start-ups is part of a corporate partnership of ominous portent for the space commons, as Bechtel is well versed in the relationship between state capture, violence and the power of mining capital to disrupt and overturn democratic norms.

3.2.3 *The neoliberal capture of mineral sovereignty*⁶⁵

In chapter 1, I illustrated how the neoliberal network has extended into the NewSpace network and how NewSpace policy has been endorsed and amplified by Atlas think tanks. Mirowski and Plehwe (2009) described the criterion for membership of the ‘neoliberal thought collective’ as an affiliation with the Mont Pèlerin Society (MPS) or the organisations comprising the Atlas Network. This is an effective means of determining ‘what is neoliberalism?’ or ‘who is a neoliberal?’ without attempting to define what is at times a contradictory or ambiguous set of philosophical principles. However, Mirowski and Plehwe’s genealogy of neoliberalism also lacks a material and mineralogical dimension. This is in keeping with the broader literature on neoliberalism which has generally taken more interest in the neoliberal policy programme for finance, health, education and carceral policy (e.g. Harcourt 2011) more than it has in the extractive and combustive industries (Walker & Johnson 2018, p.65). We will here consider ‘Atlas mineral sovereignty’.

The ascent of neoliberalism can be framed as “a reclamation by private capital of the powers of mineral sovereignty, for a time subordinate to the egalitarian ideals of popular sovereignty and social democracy” (ibid, p.62). Walker and Johnson (2018) describe several instances in which neoliberalism (as an economic philosophy and as a project in state capture) was developed in response to the nationalisation or socialisation of mineral commonwealths and infrastructures.⁶⁶ These include: Friedrich Hayek’s temporary position at the University of Chicago, which had been established through the philanthropy of John D. Rockefeller, owner of the immensely profitable Standard Oil corporation; the Thatcher Government’s re-privatising of the same mineral and energy-based industries and infrastructures that the Atlee Government had nationalised, including recurring heavy-handed

⁶⁵ In addition to the previously mentioned co-authored paper (Walker & Johnson 2018) select portions of this section were first published by me as: Johnson, M. 2018, ‘Privateering on the cosmic frontier? Mining celestial bodies and the ‘NewSpace’ quest for private property in outer space’, in J.Arvanitakis and M.Fredriksson (eds.), *Property, Place and Piracy*, Routledge, Abingdon, pp.123-139). I have obtained permission from the editors for using this material here.

⁶⁶ The influence of the Atlas Network on local mining laws is clear in numerous jurisdictions. In Australia, the Institute for Public Affairs (IPA) is one of several Atlas think tanks that exerts power in the political sphere, including through several former employees that are now elected parliamentary representatives. The IPA has received substantial philanthropic support from the iron ore magnate Gina Rinehart, approximately AUD \$4.5 million between 2016-17 (Jones 2018). Among other forays into Australian energy and climate policy, the IPA actively opposed the Gillard Government’s introduction of the Minerals Resource Rent Tax (Novak & Moran 2011), which attempted to raise public revenue through a 30% tax on iron ore and coal ‘super profits’ above \$75 million.

police responses to labour mobilisations;⁶⁷ and the role of MPS economists in Chile following the CIA-supported overthrow of the socialist Allende Government, inspired in large part by the nationalisation of copper mines previously owned by US multinationals Kennecott and Anaconda and Canadian miners, Noranda (Walker & Johnson 2018, pp.61-62).⁶⁸ In a linkage between NewSpace and neoliberal mineral sovereignty, Kennecott and Noranda were also represented in US lobbying against the third *UN Convention of the Law of the Sea* by Leigh Ratiner, lawyer-lobbyist for the L-5 Society (Ratiner n.d.).

Rather than recount further examples of neoliberal responses to competing claims to domestic mineral estates, I will focus here on neoliberal responses to developing world claims to cosmopolitan mineral sovereignties (also discussed in section 1.2.3). During the 1970s, there existed the possibility of an alternate, more equitable international politico-legal order to the international neoliberal institutions that we are now familiar with (e.g. the World Trade Organisation). In 1974, the *Declaration on the Establishment of a New International Economic Order* was adopted by the UN General Assembly with the support of the G-77 caucus of developing nations (Res. 3201(S-VI)). The New International Economic Order (NIEO) platform involved the assertion the “permanent sovereignty of every State over its natural resources and all economic properties” and “equity, sovereign equality, interdependence, common interest and cooperation among all states” (U.N. General Assembly 1971, Res. 3201(S-VI), p.3, p.4). For the most part, the NIEO stood in opposition to the appropriating practices of foreign transnational corporations within national borders (such as the dominance of US copper multinationals in Chile), rather than frontier appropriations of natural resources. The NIEO caucus members sought to protect the mineral commonwealths of newly independent nations that were once the frontier of empire.

⁶⁷ Thatcher had expanded police powers to disrupt industrial action and had even considered declaring a ‘state of emergency’ (the Schmittian exception) and a military deployment to quell discontent (Lyons 2014). Legitimising and facilitating ‘free’ markets clearly involves highly illiberal forms of coercion.

⁶⁸ Socialist President Salvador Allende continued the previous Montalva government’s acquisition of the largest US-operated copper mines, which were fully nationalised in 1971 following a unanimous vote on a constitutional amendment in Chile’s Congress. At the time, the US war machine in Indochina absorbed 10 percent of all copper used in US industry, up from 1.5 percent in peacetime (US Office of Technology Assessment 1988, p.13). Supporting the interests of mine owners Anaconda and Kennecott, the CIA (with explicit approval from Nixon and Kissinger) actively destabilised the Allende government, culminating in the 1973 Pinochet coup. MPS law-and-economics theorist James Buchanan was influential in the Junta’s 1980 rewrite of the Constitution of Chile (Fischer 2009). The revised constitution involved neoliberal reforms such as the privatisation of national education and social security systems, and illegalisation of trade unions and collective wage bargaining (Fischer 2009). The Chilean constitution was an extension of Buchanan’s long-term project, the Virginia School of constitutional political economy – this was discretely bankrolled by the petrochemical billionaire Charles Koch, a fellow MPS member and Atlas Network donor (MacLean 2017; Walker & Johnson 2018, p.62).

The UNCLOS III and *Moon Agreement* negotiations took place in the United Nations during the 1970s and were influenced by the NIEO movement. Both treaties introduced the legal concept of the ‘common heritage of mankind’: distinct from the more general ‘province of all mankind’ phrasing of the OST, the ‘common heritage of mankind’ principle asserts principles of non-appropriation, benefit sharing, non-militarisation and environmental stewardship of global commons and, as a corollary, was eventually articulated in treaties which proposed the management of these commons through international regulatory bodies (Baslar 1998, p.xx-xxi). The concept of the ‘common heritage of mankind’ was first expressed in 1967 by Arvid Pardo, the Maltese delegate to the United Nations – it then appeared in a 1970 General Assembly declaration on rights to the sea-bed and ocean floor, before being expressed in the 1979 *Moon Agreement*, the final *Law of the Sea Treaty* and a 1982 declaration on Antarctica (Baslar 1998, p.ix-xx). Brazil, Colombia, Venezuela and several other Latin American nations had considered the *Moon Agreement* as an effective part of the NIEO (Gangale 2009, p.68).

The *Moon Agreement* and UNCLOS III involved similar codifications and management regimes for the ‘common heritage of mankind’ in their respective environments. The *Moon Agreement* included articles that codified the free and equitable use principles first ratified under the OST, heralding a commons management schema that aimed to deliver benefits to all humanity (if space resource exploitation were to eventuate). Unlike the OST and more general phrasings like the ‘province of all mankind’, an explicit prohibition on natural resource ownership had been made in the *Moon Agreement*. The Agreement begins by stating that the provisions it makes for the Moon are equally applicable to all celestial bodies; Article 11 then states:

“The Moon and its natural resources are the common heritage of mankind ... Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or nongovernmental entity or of any natural person”
(*Moon Agreement* 1979).

In the eventual UNCLOS treaty (1994), meanwhile, Part XI makes provisions regarding the management of the ocean floor outside national jurisdiction – referred to simply as The Area. The Area was also to be the ‘common heritage of mankind’ (UNCLOS 1994, Art.136), also extending the non-appropriation principle to both states and any ‘natural or juridical person’ (Art.137). Further still, it required State parties to engage in technology transfer from

developed to developing nations, in addition to distributing a share of resource profits obtained from mining deep, international seabeds (Art. 140). The International Seabed Authority is the organisation created through the UNCLOS Part XI agreement: its major role thus far has been to grant exploratory licenses for private mineral extractors, but no deep sea mine has successfully been realised.

The restrictions on private mineral appropriation envisioned under the UNCLOS treaty, the *Moon Agreement* and NIEO were anathema to the ‘liberal international economic order’ supported by neoliberal actors (Bandow 1985). We have discussed how the Reagan Administration was the first American neoliberal government – it adopted neoliberal rhetoric of ‘freedom’ and ‘small government’ and employed numerous personnel with links to Atlas think-tanks. I have described how the Administration refused to sign the *Moon Agreement* (1979) and I argued that this refusal involved collaborations between L-5 Society lobbyist Leigh Ratiner and former Atlas writers turned Reagan staffers, like James Malone and Doug Bandow. The terms of the *Moon Agreement* had been reached through the consensus of UNCOPUOS meetings during the 1970s, in which the US was a participant (Popova, in IISL 2016, p.5). However, it is essentially a ‘failed treaty’: the Reagan Administration and ensuing US Governments rejected the *Moon Agreement* in its entirety, and most spacefaring powers followed suit. ESA member states Austria, Belgium and the Netherlands have ratified it, while France and India have signed but not ratified it. To this day, only 18 states are party to it, meaning that “91.7 percent of the membership of the United Nations...have refrained from becoming a party to it for over three decades” (Marboe & Johnson, in IISL 2016, p.33).⁶⁹ Officials from the Reagan Administration appear to have provided little public justification for the rejection of the *Moon Agreement*. An official line on the Administration’s opposition to Part XI of UNCLOS comes from then Ambassador James Malone: ‘[The] political, economic and ideological assumptions which underlay the treaty are essentially antithetical to

⁶⁹ This does not mean that the *Moon Agreement* is irrelevant to discussion on space resources law. Space lawyer Steven Freeland (Freeland 2017; in IISL 2016, pp.35-38) highlights how the *Moon Agreement* represents subsequent state practice on the issue of space resources exploitation – it is an interpretation of the OST that can be construed as providing guidance on how to further interpret the OST’s principles when they have not yet been realised in practice and accepted by states as customary international law. Freeland suggests that the *Moon Agreement*’s undertaking to establish a regime for equitable exploitation implies that exploitation would one day be permissible. Moreover, the appropriation prohibitions are on property rights, or ownership: it might still be permissible to establish “extra-terrestrial exploitative rights” – akin to terrestrial mining rights – so long as they were granted under this international regime and to the terms of the *Agreement*, rather than through an extra-territorial extension of national sovereignty or without the consensus of the international community (Freeland 2017). This is of course under the terms of an international agreement that has not been ratified by any spacefaring power – however, subsequent state practice on the *Moon Agreement* is discussed further in section 6.2.1.

American values [and promote] a thinly disguised world collectivism' (Malone, cited in Hufford 1983, p.127).

Far from being an isolated triumph of the O'Neill-inspired L-5 Society, the US refusal to sign the *Moon Agreement* was part of a broader neoliberal foreign policy agenda that involved protecting corporate freedoms to extract from the global commons (and domestic oil and gas commons). The Heritage Foundation was influential across this extractivist foreign policy platform. For every incoming Republican president following Reagan's 1981 inauguration, the Heritage Foundation has published a series of reports called *Mandate for Leadership*.⁷⁰ In the *Mandate* series, the Atlas-MPS network provides a highly specified agenda and list of policy recommendations, many of which have been implemented by the Republican Governments of the past 4 decades. Among the first edition's 1,100 pages of policy mandates, Heritage writers implored the Reagan Administration that a "'resource war' is very much a possibility when one considers the power the Third World is trying to assert" through the 'common heritage of mankind' principle and the NIEO (in Heatherley 1981, p.553).

Outside the question of extra-territorial mineral sovereignty, the neoliberal mobilisation against the NIEO has had immense ramifications for the politico-legal institutions of the global economy. The NIEO prompted a counter-revolution in neoliberal development policy that would instead prioritise "macroeconomic stabilization, liberalization, and privatization as the prescription for the developmental cure" (Bair 2009, p.348). "From the 1980s, neoliberal forms of rule were globalised in the form of the Washington Consensus imposed upon developing nations by the IMF and the World Bank in the form of 'structural adjustment policies', leveraging a shift from national welfarism and import substitution to export-led development and foreign direct investment" (Walker & Johnson 2018, p.62). Bair (2009) has documented the role of MPS economists and Heritage Foundation personnel in defeating a key instrument of the NIEO: a code of conduct to be observed by multinational corporations operating in developing countries, requiring they respect the political sovereignty and laws of those nations.

⁷⁰ The first iteration of the Heritage *Mandate* was clearly consistent with the neoliberal philosophy of MPS members like Hayek: "the free market, operating as a vehicle for millions of individual decisions, is a more efficient allocator of resources than government and leads, therefore, to greater production and higher real income for all workers" (Heatherley 1981, p.958). Reagan had reportedly distributed the first report with evangelical zeal, enacting 60% of its recommendations in his first term (Blasko 2004). The 7th and most recent *Mandate* report was published immediately after the election of Donald Trump.

Ultimately, the contest over the space commons is reflecting problems of global commons on Earth. Neoliberal mineral sovereignty illustrates the synergy between the organised obstruction to international climate treaties and the NewSpace-neoliberal rejection of the *Moon Agreement*. In America, Atlas think-tanks like the Heritage Foundation and the Cato Institute have been supported by corporate philanthropy, with significant funding from the petrochemical billionaire Charles Koch. Greenpeace has published a list of organisations funded by ExxonMobil to spread climate science denial and oppose international climate treaties (ExxonSecrets n.d.). The American components of that list are effectively identical to the American member organisations co-ordinated through the Atlas Network (Walker & Johnson 2018, p.62).

One policy analyst with Heritage asserted that the United States should continue “to resist pressure to sign the Moon Treaty” and also “consider withdrawing its financial support” from the United Nations Committee on the Peaceful Uses of Outer Space (Copulos 1985). This language mirrors the stance that Heritage and other neoliberal organisations would take with attempts at the just and equitable management of climate change – as is clear from the first attempts at developing treaty law to limit atmospheric carbon pollution at the 1992 Rio Earth summit. As I have discussed, James Malone’s career involved a revolving door between Heritage and the Reagan Administration. In his later stint as a Heritage policy writer, he outlined a position for the US delegates to Rio that became the default goal of many US climate negotiations: “Do not draft a detailed plan for reducing specific quantities of ‘greenhouse gases’ by a set date” (Gacek & Malone 1992, p.8). The neoliberal political project has thus involved capturing state power through a coordinated network working to preserve the geological agency of multinational energy and resources companies, preventing citizens and governments from bringing mineral sovereignty under democratic control.

3.3 Extra-parliamentary, exo-geological power: the making of the *Commercial Space Launch Competitiveness Act*

In chapter 1, I described the origins of off-world private property in the O’Neillian tradition and the gradual alignment of NewSpace commercial-colonisation discourses with neoliberal policy and advocacy. The Reaganite commercialisation agenda led to the establishment of well-funded space mining start-ups. In this section I will describe the lobbying work conducted by the space mining start-up Planetary Resources, to which we can directly attribute the passage of the *Commercial Space Launch Competitiveness Act* (CSLCA 2015) into law.⁷¹ I offer here a detailed case study in extra-parliamentary mineral sovereignty, in which a (space) mining firm can be seen shaping the legal architecture of the US state. I will demonstrate Planetary Resources’ influence on domestic public law, chiefly through the firm’s lobbying expenditures (CRP 2018a; 2018c).⁷² The passage of this Act reflects broader problems in contemporary democracy both within and outside of the United States.

3.3.1 The first attempt at domestic space resources law: lobbying for the ASTEROIDS Act

Following a re-branding (from Arkyd Astronautics), Planetary Resources announced themselves to much fanfare in 2012. With high profile backers like Google’s Larry Page and Eric Schmidt, film director James Cameron and O’Neillian techno-utopian entrepreneur Peter Diamandis, the company told the world it was going to mine the high frontier.⁷³ A legislative guarantee of private property rights was essential for attracting additional capital, as it heralded the prospect of returns on risky seed investments. Its core commodity would be mining water ice from asteroids and providing combustible energy off-world (in the form of rocket propellant), with mining metals for off-world manufacturing something of a stretch-goal. Between 2012-16, Planetary Resources raised US \$53 million in investment

⁷¹ I am indebted to the advice of Professor Joanne Gabrynowicz in compiling this section, particularly for pointing me towards the increasing role of ‘industry committee reporting’ in US space law and some of the finer points of the Congressional record.

⁷² The data I present here reflects only what has been disclosed to the Senate Office of Public Records or discussed in Congressional transcript. The lobbying interfaces that emerge from ‘stalking the corridors of power’, as it were, commonly involve less visible and documented forms of political influence.

⁷³ Peter Diamandis is the company’s co-founder. He is a serial NewSpace entrepreneur and a former L-5 Society member (Michaud 1986, p.100). Eric Anderson is another Planetary Resources co-founder: previously he founded Space Adventures, a company which has organised visits to the International Space Station for wealthy tourists at roughly \$20 million a trip.

(CrunchBase 2019a).⁷⁴ In addition to Page, Schmidt and Cameron, investments came from other wealthy ICT entrepreneurs like Atlas affiliate Peter Thiel (through his Founders Fund), Charles Simonyi (Microsoft) and the Space Angels venture capital network. In 2016 (after the passage of the CSLCA), the firm also received a €25 million grant from Société Nationale de Crédit et d'Investissement, the public investment bank of the Grand Duchy of Luxembourg (Planetary Resources 2016a). This latter investment lends some credence to the NewSpace argument that private property rights are essential for investment in the space mining industry (though, as I will discuss in the dissertation's Epilogue, the industry is facing fresh challenges).

Planetary Resources hired personnel in a manner consistent with the 'revolving door' that often occurs between the public and private sectors. In addition to NewSpace entrepreneurs and Silicon Valley elites, the company employed a range of experienced US Government space professionals. Some of Planetary Resources' senior management and advisory staff have held high-profile US Government appointments. Peter Marquez is the company's Vice President of Global Engagement. He was Director of Space Policy under the George W. Bush and Obama administrations and he authored the 2010 US National Space Policy (Planetary Resources 2013b). General Counsel Brian Israel joined has represented the US in the UN's outer space Legal Subcommittee, and between 2012-16 was "the U.S. Government's lead lawyer for international legal aspects of outer space" (Planetary Resources n.d.-c). Science advisor Dante Lauretta is chief investigator of NASA's Lockheed-Martin built *OSIRIS-Rex* asteroid sample retrieval mission (2016-2023). In her history of the American space industry, Lisa Bromberg cites a joke from a former NASA executive: "the definition of an entrepreneur here in Maryland was somebody who used to work for the government and now sells to it" (in Bromberg 1999, p.117). Based outside Seattle, Planetary Resources offers a West Coast example of former government employees now engaged in private sector employment. A neoliberal model of space exploration risks further 'hollowing out' of public sector expertise, as it is transferred to the private sector.

The road to the passage of the CSLCA begins with the *American Space Technology for Exploring Resource Opportunities in Deep Space Act of 2014*, commonly abbreviated to the *ASTEROIDS Act* (H.R. 5063; henceforth, the *ASTEROIDS* bill). The *ASTEROIDS* bill was introduced to the US House of Representatives on 10 July 2014 by Rep. Bill Posey (R-

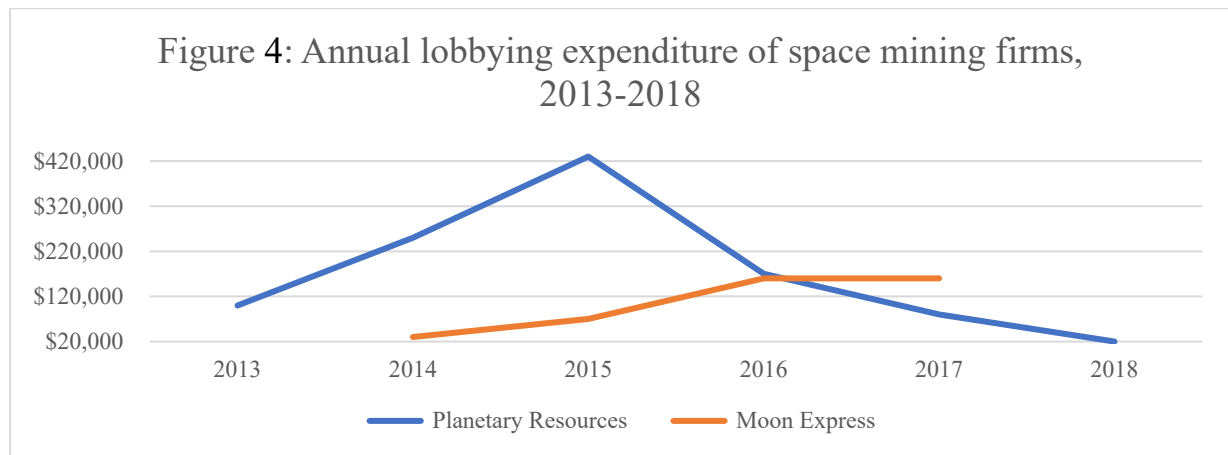
⁷⁴ Their 2016 lobbying expenditures (after the CSLCA was passed) were focused on the *American Space Commerce Free Enterprise Act of 2017*, which I discuss in section 5.2.2.

FL). It contained provisions that would guarantee private ownership of off-world minerals but used language that rendered the relationship between national and private appropriation entirely unambiguous. It stated that the President shall “facilitate the commercial exploration and utilization of space resources to meet national needs” and that the “district courts of the United States shall have exclusive jurisdiction” of any legal action brought by an (American) space mining firm against a rival party for interference in resource exploration and utilisation (ASTEROIDS Act 2014, s.51301). The *ASTEROIDS Act* was a clear contravention of the OST’s non-appropriation principle: it attempted to authorise ‘exclusive jurisdiction’ for US courts and legalise the exploitation of celestial bodies to meet ‘national needs’. It nonetheless enjoyed bipartisan support: 11 Democrats and 9 Republicans either sponsored or co-sponsored the Bill (U.S. House of Representatives 2014). In this light, it would be remiss to treat neoliberal space law as though it were limited to the US Republican Party – there is an evident bipartisan neoliberalism in many jurisdictions, in which the ‘centre’ of the political spectrum is pushed further towards economic liberalism.

Sovereign are they who write the laws, we might say. The *ASTEROIDS* bill appears to have been written at the request of Planetary Resources. The company’s website lists Henry Hertzfeld as a legal advisor, Professor of Space Policy and International Affairs at George Washington University (Planetary Resources n.d.-a). When the CSLCA is debated on the House floor, Rep. Posey introduces a letter of support co-authored by Hertzfeld. Democratic Rep. Donna Edwards (D-MD), who opposed elements of the CSLCA, remarked that “one of the authors [of that letter of support], in fact, is paid by one of the companies that is involved in this legislation” (Cong. Rec. 2015a, p.H3520).

Precisely who wrote the *ASTEROIDS* bill is perhaps less important than the fact that Planetary Resources made a concerted effort to push this bill into US public law by purchasing lobbying expertise. There is ample evidence of the start-up’s direct influence on the introduction of the *ASTEROIDS* bill to Congress. The bill’s original cosponsor was Derek Kilmer (D-WA), the Representative for Washington state’s 6th Congressional District – this District neighbours Planetary Resources’ head office in Redmond. Public disclosures under the *Lobby Disclosure Act of 1995* reveal that Planetary Resources spent a total of \$210,000 in 2014 on the services of the law firm K & L Gates (CRP 2018a). Of this total, K & L Gates made a \$5,500 contribution to Kilmer’s 2014 Congressional campaign (CRP 2018b). Planetary Resources – through K & L Gates – was the sole organisation registered to lobby

on this bill (CRP 2018c).⁷⁵ The lobbying outlays of Planetary Resources are graphed below, with Moon Express’s smaller expenditures visible for comparison (Figure 4). While fellow space miners Deep Space Industries expressed support for the CSLCA when it was signed into law (DSI 2015), they appear not to have spent any money on lobbying.



Source: CRP 2018a & CRP 2019a

K & L Gates’ lobbying for Planetary Resources was no doubt aided by their employment of a number of former Congressmen turned lobbyists (CRP 2019b). Of those who lobbied on behalf of Planetary Resources in 2014, Bart Gordon (D-TN, 1985-2011), Slade Gorton (R-WA, 1989-2001) and James Walsh (R-NY, 1993-2009) have all served as either Congressmen or Senators. This mirrors the revolving doors and ‘golden escalators’ that exist between public office and the terrestrial mining industries. Adam Lucas describes these professional networks in the Australian resource sector, noting that the mining industries court “individuals who hold public office in relevant portfolios as potential allies and future employees” (2018). This is a practice so commonplace in contemporary democracies that using words like ‘corruption’ might appear an exaggeration. Yet when former parliamentary or Congressional representatives are employed by lobbying firms to act on behalf of corporate clients – exploiting the personal and professional networks they established when working as democratically elected representatives – the prospect of governing ‘for the people’ has been compromised.

In a defeat for the space mining industry, the *ASTEROIDS* bill never proceeded beyond consideration by the House Subcommittee on Space (of the Committee on Science,

⁷⁵ The lobbying activity conducted by Planetary Resources is of course legal, and the sums involved pale in comparison to the lobbying outlays of other corporate interests. For example, Koch Industries, the petrochemical conglomerate owned by Atlas Network allies Charles and the late David Koch, spent over \$24 million in campaign contributions and lobbying in that same 2014 mid-term election cycle (CRP 2018d).

Space and Technology). Hearings on the bill were held in September 2014. Public hearings with invited expert testimony are an important part of democratic law-making in the US: they allow discussion about the strengths and weaknesses about legislation to be aired (which is valuable for transparent political discourse even if governments choose not to heed expert opinion). Gabrynowicz (2014) was one expert invited to testify before the Subcommittee, and she described the problem of national appropriation raised by the bill's declaration that US courts would have 'exclusive jurisdiction' over potential disputes. She stated that "it should be expected that there would be both legal and political challenges to its terms" (Gabrynowicz 2014, p.10). Another witness pointed to the absurdity of such legislation: that "there can be no commercial enterprise without a market. For water, there is no market [in space] that exists today" (Sykes 2014, p.11). Implementing the *ASTEROIDS* bill seemed contentious and premature to Committee members. Following these Hearings, Planetary Resources would go back to the drawing board and the *ASTEROIDS* bill itself was abandoned.

3.3.2 The second attempt: the road to the Commercial Space Launch Competitiveness Act

Between 2014-15, Planetary Resources continued to lobby for revised bills featuring private property rights to mined space resources (CRP 2018a). Republican control of Congress became instrumental in pushing an off-world mineral resources bill over the line. In the November 2014 Congressional mid-terms, the Republican Party recorded its largest Congressional majority since 1929. This huge loss for the Democrats was spurred, in part, by conservative interest groups who attacked the *Patient Protection and Affordable Care Act* ('Obamacare') – the Koch brothers and Atlas think-tanks being particularly vocal opponents. One co-sponsor of the new space resources bills (discussed below) was Jim Bridenstine (R-OK), President Trump's recent appointment to NASA Administrator, and Dana Rohrabacher (R-CA; U.S. House of Representatives 2015a & 2015b). Amongst a massive lobbying outlay for these mid-terms, Koch Industries made a small contribution to Bridenstine (\$5,000), for free-market reforms likely unrelated to space resources (CRP 2018d).

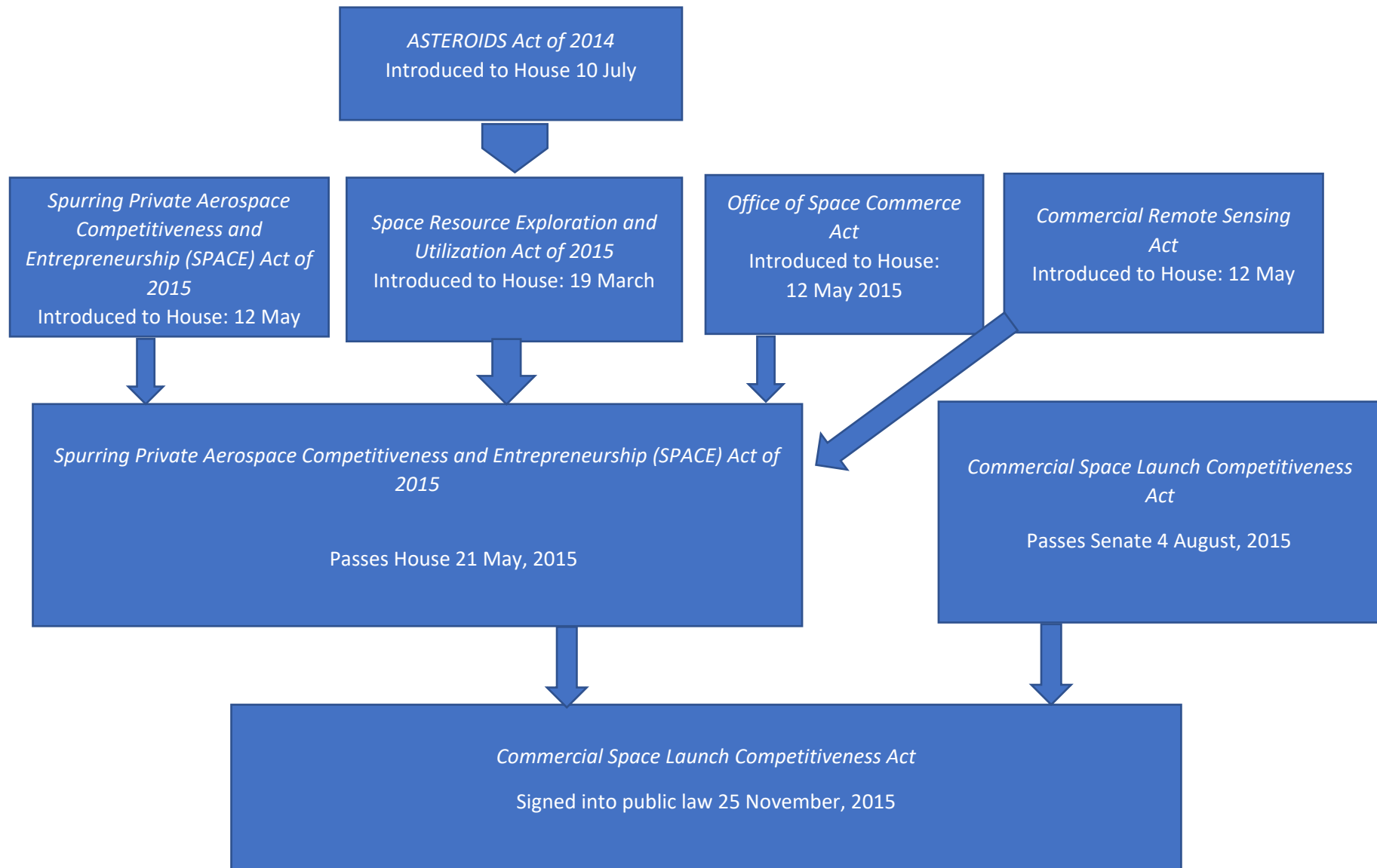
The *ASTEROIDS Act* bill and its guarantee of private mining rights were re-packaged as the *Space Resource Exploration and Utilization Act of 2015* (H.R. 1508; henceforth the *Space Resource* bill). This new bill was introduced to the House in March 2015. Planetary Resources are again listed as a lobbying organisation for H.R.1508, joined on this occasion

by aerospace and military contractor United Technologies Corporation (CRP 2018f).⁷⁶ Their 2015 lobbying outlay, shared between three hired lobbying firms, totalled \$430,000 (CRP 2018a). The *Space Resource* bill retained the problematic ‘national needs’ language and the assertion of US district courts’ exclusive jurisdiction on any disputes (H.R. 1508, s.51302-3). An identical Senate companion bill (S.976; 2015) was introduced by Patty Murray (D-WA) of Planetary Resources’ home state, in order for the legislation to be discussed in the other chamber. It was co-sponsored, among others, by influential Republican Senator Marco Rubio (R-FL; US Senate 2015a).

The final legislative manoeuvres leading to the legal guarantee of off-world mining rights are convoluted and involve the amalgamation of several bills (Gabrynowicz 2017). During these legislative steps, additional political actors are drawn into the process, including space resources and transportation start-up Moon Express and heavyweights of the ‘big aerospace’ lobby, like Boeing and Northrop Grumman (CRP 2018e). Figure 5 (below) outlines the various bills that were eventually amalgamated as the *Commercial Space Launch Competitiveness Act*. Through this amalgamation of pro-space commerce reforms, a broader array of conservative or neoliberal politicians are drawn into supporting legislation that contains recognition of off-world private property rights. In addition to Rubio’s involvement, far-right Republican Ted Cruz (who is frequently endorsed by Atlas organisations) introduced a bill titled the *Commercial Space Launch Competitiveness Act* to the Senate on 12 May 2015 (S.1297; U.S. Senate 2015b). The provisions of this bill were aimed at US aerospace corporations much larger than space mining start-ups (such as those in Rubio and Cruz’s constituencies) and are now also public law. Cruz’s bill afforded ‘big aerospace’ some reductions to the “maximum probable loss” in insurance claims made against private space launch providers, while also deferring reporting on “voluntary industry consensus standards” and other generous self-regulatory ‘learning periods’ (CSLCA 2015, s.102, s.111). For O’Neillian space mining advocates who have bemoaned the impact of the big aerospace lobby – a bureaucratic, ‘socialist monopoly’, it has been called (Tumlinson 2003) – the realisation of off-world mining rights appears to have depended on their political clout.

⁷⁶ United Technology Corporations (UTC) has previously played a bit part in the neoliberal-NewSpace narrative. Alexander Haig was the company director in late 1970s and later became Reagan's first Secretary of State in 1981. In 1979, Haig testified before Congress and attacked the *Moon Agreement* and UNCLOS III: “the common heritage concept expressed in the treaty underlies Third World efforts directed at a fundamental redistribution of global wealth” (in Levine 2015).

Figure 5: The legislative pathway to the CSLCSA



In the House, the *Space Resource* bill and other pieces of legislation amenable to space commerce were merged into the *Spurring Private Aerospace Competitiveness Act* or SPACE Act (H.R. 2262), which passed a House vote on 21 May. The *Commercial Space Launch Competitiveness* bill passed a Senate vote on 4 August 2015. Having passed both chambers independently, in November 2015 the provisions of the House SPACE Act and the Senate CSLCA were signed into law as the *Commercial Space Launch Competitiveness Act* – which now contained provisions for private property rights on space resources.

In spite of all these manoeuvres, the space resources provisions of the CSLCA remained problematic in terms of international law. Under Senate Amendments in October 2015, the ‘national needs’ language had been watered down to direct the President to “facilitate commercial exploration for and commercial recovery of space resources by United States citizens” (CSLCA 2015, s.51302) and the ‘exclusive jurisdiction’ provisions are dropped entirely. Yet a ‘Disclaimer of Extraterritorial Sovereignty’ is added to say, “It is the sense of Congress that by the enactment of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body” (ibid, s.51303). ‘It is the sense of Congress’ is a non-committal, “illusory” phrase (Gabrynowicz 2019, pp.5-6). Its inclusion appears to reflect law-makers’ own uncertainty of the CSLCA’s legality under the OST.

The long road to the passage of the CSLCA also illustrates how problems in representative democracy can emerge amid the ‘busy work’ of the legislative process. This has consequences for international law. Despite this apparent uncertainty amongst some law-makers about the legality of the various components of the CSLCA, elements of the Congressional legislative process were pushed aside to bring this bill into public law. The strong Republican majority in both chambers afforded some degree of influence over the Congressional schedule (Edwards, in Cong. Rec. 2015, H3512). At least some of the actors involved appear concerned about encountering the scrutiny of expert witnesses (that lead to the demise of the *ASTEROIDS Act*), because no expert witnesses were called to testify on the question of private space resource property rights that appeared in the follow-up bills that lead to the CSLCA (House Committee on Science, Space and Technology 2015a).

A further undermining of Congressional process was evident. The standard legislative process involves a ‘mark-up’ session that follows a hearing. Mark-up is a longstanding tradition in which congressional committee members would debate, amend and ‘mark-up’ any changes needed for the legislation to progress further. Usually this process takes place

with warning and ample time for consideration. The CSLCA bill was referred to the House subcommittee on 12 May 2015 and an abrupt mark-up session was held the following day (U.S. House of Representatives 2015a, in Gabrynowicz 2018, pers. comm., 12 June). Eddie Bernice Johnson (D-TX) had written the Minority View statement in the House Committee Report on the *Space Resources* bill, stating that:

“There has been no legislative hearing on this bill, or even a subcommittee markup, nor have we gotten the views of the Administration, including those responsible for tracking our international treaty obligations...” (in House Committee on Science, Space and Technology 2015b, p.20).

At least some Congressional representatives were concerned that the space resources provisions were inconsistent with international law. Yet traditional democratic processes were clearly subverted during this process, possibly to avoid scrutiny of the CSLCA-OST issue. When the amalgamated *SPACE Act* was discussed on the Congressional floor, House Minority Leader Donna Edwards noted that “with the backdrop of meeting the majority’s floor schedule as the top priority, there was insufficient time given to negotiate a compromise before last week’s full committee markup” and that,

“it would also be prudent, Mr. Chair, to hold hearings on these issues and on this legislation, as well as to have a subcommittee markup, what we sometimes refer to as regular order” (Cong. Rec. 2015, H3512).

It would be too much to suggest that the passage of the CSLCA through two Republican chambers of Congress would represent a Schmittian suspension of the constitution, yet there was a clear suspension of regular process that amplified the voice of the NewSpace lobby. We have clear evidence that corporate power co-opted regulatory process, in order to direct the US state to commit what I have argued is a contravention of UN treaty law.

If we look now to future developments in US space law, safeguarding and protecting corporate profitability in space may involve new modes of state capture and democratic takeover. These issues, in turn, may have further ramifications for international space law. ‘Industry committee reporting’ may play a part in establishing new state-corporate interfaces in the legislative process.⁷⁷ Planetary Resources also lobbied for the *American Space*

⁷⁷ One influential committee in US space policy is the Commercial Space Transportation Advisory Committee (COMSTAC), an advisory board of the Federal Aviation Administration – which is part of the Executive Branch. In the immediate aftermath of the public *ASTEROIDS Act* Hearings, Planetary Resources’ Peter Marquez and Brian Israel (then with the Department of State) presented before the COMSTAC Business and Legal Working

Commerce Free Enterprise Act (2017, H.R.2809; CRP 2019c).⁷⁸ The ASCFE proposes a new ‘Private Space Activity Advisory Committee’. This committee is intended to “provide recommendations to the Secretary and Congress on how the United States can facilitate and promote a robust and innovative private sector that is investing in, developing, and operating space objects” (ASCFE 2017, s.80109). The ASCFE stipulates that “Members of the Committee may not be Federal Government employees or officials”, and that:

“Members of the Committee shall include a variety of space policy, engineering, technical, science, legal, and finance professionals. Not less than three members shall have significant experience working in the commercial space industry” (ASCFE 2017, s.80109).

Rather than ironing-out issues of domestic space law in the chambers of Congress, industry committee reporting opens up a new window of influence for pro-industry voices into the reform process. Gabrynowicz points to the consequences of creating new legislation that creates new industry advisory bodies which, in turn, can shape further legislation:

“The formula consists of the generous use of technical legal terms of art that do not create law; numerous calls for studies and reports on topics and issues rather than addressing the actual substance of the topics and issues; and the establishment of advisory committees whose work is to be integrated into the ongoing research and reporting. The reports are to be sent to specific Congressional committees for further action. Together this establishes an interconnected mechanism among agencies, advisory committees, and Congressional committees in which lobbying, advocacy, and the legislative process become interchangeable” (2019, p.5).

The ASCFE passed the House in April 2018. At the time of writing, it appears to have progressed no further than the Senate subcommittee level (though a bill with similar provisions, also called the *American Space Commerce Free Enterprise Act of 2019*, was introduced to the House the following year). Regardless of whether these bills become law, they provide a stark example of the impact that corporate influence on domestic law-making can have on international law. Possibly at the request of the space mining lobby, the ASCFE contains the brazen proclamation that “Notwithstanding any other provision of law, outer space shall not be considered a global commons” (ASCFE 2017, s.80109). This suggests that,

Group (in Kunstadter 2014). This forum is an example of the less common fora that can give commercial space actors a voice in the legislative process.

⁷⁸ There are other NewSpace attempts at lobbying for pro-colonisation and commercialisation laws (e.g. the *Space, Exploration, Settlement and Development Act of 2016*) which are outside the scope of this analysis.

as per the *Moon Agreement* and the seabed mining restrictions of the UNCLOS treaty, the US state-corporate empire will continue to undermine treaties seeking to govern the global commons on principles of common heritage.

3.4 Conclusion

The passage of the CSLCA is a case study in the influence of mining capital (and venture capital) influencing local political institutions. Regardless of how ‘NewSpace democracy’ might transpire in future space colonies, the CSLCA demonstrates that – as the power to make political and legal decisions – sovereignty is wielded by extractive capital, such that democratic norms and legal institutions of the global commons are undermined. If an individual or organisation can spend US \$1,050,000 on lobbying, as did Planetary Resources between 2013-2018 (CRP 2018a), they will clearly enjoy a greater level of access to lawmakers and greater influence in the legislative process than does the average citizen. It represents a transfer of power in one sphere (such as economic power resulting from resource profits or digital technologies) to another – political power that can direct government policy and public law (Brown 2015).

Moreover, the history of mineral sovereignty indicates that mining rights could never be commensurate with the terms of the *Outer Space Treaty* and the legal norm that outer space “is not subject to national appropriation by claim of sovereignty” (OST 1967, Art. 2). To reframe these terms, we can say that private resource claims under the CSLCA would constitute an act of *state-corporate appropriation* by sovereign claim – in both the sense that the CSLCA represents a corporate capture of the US state, and that the authorisation, legitimisation and protection of mining rights have historically been anchored in the sovereignty of nation state and empire.

The elite fantasy of refuge in space from social obligations and an increasingly inhospitable Earth may yet be just that – a fantasy – but it serves to illustrate the point that “mineral sovereignty is inherent in the deep genealogy and cosmic imaginary of political power” (Walker & Johnson 2018, p.64). Familiar terrestrial concerns are at stake in the enclosure of the off-world mineral commonwealth: state-corporate prerogatives of accumulation and growth are to be secured through assertions of mineral sovereignty, in direct collision with the claims of popular sovereignty or international law to manage the common wealth with laws of the people, by the people and for the people (Walker & Johnson

2018, p.64). Yet, in anticipation of actual acts of mineral appropriation in space and the ongoing need to ensure private investment in space mining ventures, supporters of the CSLCA have mounted a number of legal arguments claiming that unilateral space resources law is in fact legal under the terms of the OST. We will turn to these arguments, and the origins of international space law, in the following chapter.

4. Making and re-making the ‘space constitution’: the common heritage of humankind or neoliberal constitutionalism?

Thus far I have explored the relationship between private and national appropriation in terms of neoliberalism’s state-supported corporate freedoms (Chapter 1), the enclosure of commons through sovereign powers of lawful appropriation (Chapter 2) and the politico-legal field of mineral sovereignty, in which the distinction between state and private appropriation is blurred significantly (Chapter 3). Here I will broaden my analysis to focus on international laws of the global commons, and delve more deeply into the contents, history and interpretation of the *Outer Space Treaty* (OST 1967).

The US *Commercial Space Launch Competitiveness Act* (CSLCA 2015) projects private property law onto the novel frontier of deep space, and I have drawn parallels with the historical development of property rights in land and the sub-soil. Now we will progress to new elemental categories beyond land: the laws of the air and sea. Space law evolved from international laws of the high seas and the concept of national airspace. Much like the ship and airplane before it, the spacecraft opened up a new domain of extra-territorial space, and international law developed alongside this technological change. Schmitt’s genealogy of international law began with the primacy of land appropriation in law and order (2003 [1950]). Yet he was equally concerned with the sea as a ‘space of exception’, where a different order prevailed to the terrestrial order of the European continent (Schmitt 2003; Minca 2005).

“The sea knows no apparent unity of space and law, of order and orientation...On the sea, fields cannot be planted and firm lines cannot be engraved. Ships that sail across the sea leave no trace. ‘On the waves, there is nothing but the waves’...The sea is free” (Schmitt 2003, p.43).

In the 17th century, the Dutch jurist Hugo Grotius (2004 [1609]) mounted an influential legal argument that similarly described international waters as the ‘free seas’ (*mare liberum*) – the high seas were open to all and not subject to national appropriation. Like outer space, the high seas are a *res communis* global commons.

Outer space was given this legal status in the supranational, post-Westphalian order of the United Nations. The OST and *Moon Agreement* are legal frameworks that sought to establish the status of celestial bodies as ‘the province of all mankind’ and to codify the collective benefits that could be derived from off-world extractivism, respectively. *The Moon*

Agreement has only been ratified by a handful of countries, owing in part to the opposition of Reagan-Atlas neoliberalism in the early 1980s. The OST has been much more widely ratified: on the 50th anniversary of its entry into force, 105 states had become parties to the OST (U.N. General Assembly 2017, Res.72/78).

The OST has been described as ‘quasi-constitutional’ (Gabrynowicz 2004, p.1042). It incorporates the UN Charter, extends international law into outer space, establishes fundamental principles and rights for the use of space, and it forms the backbone of all international space law. Nations take cues from the OST in developing their domestic space laws (ibid, p.1042). Much like liberal constitutions the world over, the OST is concerned primarily with defining and limiting the scope of government action. All nations with launch capabilities (and many without) have ratified the Treaty. The OST is thus “the cornerstone of the international legal regime governing outer space activities” and ‘constitutes’ an international political community vis-à-vis outer space (U.N. General Assembly 2017, Res.72/78, p.15).

Like the liberal constitutions of Earth, the OST is an unstable political framework and is open to interpretation, often along ideological lines. There is widespread disagreement as to what the OST actually encourages and prohibits. Many space lawyers have pointed to the potential incompatibility of space mining with the Treaty’s core tenets – in particular, whether the CSLCA’s ownership provisions would be in keeping with American OST obligations to ensure that its use of outer space was for the ‘benefit of all mankind’ (Tronchetti 2015; Hobe & de Man 2017; Jakhu, Pelton & Nyampong 2017; Freeland 2017). These tenets describe space as a commons: it should be governed through collective decision-making on principles of freedom of access, non-appropriation and the global common interest in peaceable, co-operative use of space. However, as many scholars of space resource appropriation have asserted, the OST’s precepts are vague or unclear (e.g. Wasser & Jobses 2008; Dunk 2012; Lee 2002). There is no explicit prohibition on mineral resource appropriation in the OST and it does not specifically discuss this potential mode of ‘using’ outer space (IISL 2016, p.34; Masson-Zwaan & Palkovitz 2017, p.8). Yet, as I have argued, it is not self-evident that the ‘non-appropriation principle’ can effectively demarcate national from private appropriation, or that neoliberal accumulation via off-world mining rights will “be carried on for the benefit all peoples irrespective of the degree of their economic or scientific development” (OST 1967, preamble).

Some people who have made arguments that the CSLCA is consistent with the US's OST obligations appear to have a financial interest in doing so. Legal and business representatives of space mining start-ups have asserted that private mining rights are commensurate with a *res communis* understanding of outer space (Kfir 2016; Marquez 2017; Kfir & Perry 2017). Some have explicitly voiced support for the OST, presumably because its perceived terminological ambiguity affords ample “stability and predictability” for the changing needs of space commerce (Marquez 2017, p.4). Sometimes outer space's status as a commons is disputed (Hertzfeld, Weeden & Johnson 2016; Pace 2017). Hertzfeld, Weeden and Johnson note that “the noun, commons, never appears in any space treaty”, only “descriptors” like ‘common interest’, ‘common heritage’, ‘common procedure’ and ‘common understanding’ (2016, p.17). These authors, one of whom has worked for Planetary Resources, highlight that the OST does not provide “any direct guidance for the future handling of space resources” (Hertzfeld, Weeden & Johnson 2016, p.17). Scott Pace,⁷⁹ a former RAND Corporation analyst and President Trump's appointee to head the National Space Council advisory body, has offered this pugilistic and nationalistic interpretation of the OST:

“...outer space is not a ‘global commons’, not the ‘common heritage of mankind,’ not “res communis,’ nor is it a public good. These concepts are not part of the Outer Space Treaty, and the United States has consistently taken the position that these ideas do not describe the legal status of outer space... To unlock the promise of space, to expand the economic sphere of human activity beyond the Earth, requires that we not constrain ourselves with legal constructs that do not apply to space... As with past frontiers, it is those who show up, not those who stay home, who create the rules and establish the norms in new areas of human activity.” (Pace 2017, p.4).

Despite claiming that the terms of the OST can be interpreted in favour of US corporate interests, Pace ultimately invokes a Schmittian understanding of the neoliberal *nomos* that awaits in the off-world. International treaty law is treated as less important than the rules created ‘by those who show up’ – an argument that it should be the appropriators who make resources law in space.

⁷⁹ Pace is also a colleague of Henry Hertzfeld, the possible author of the *ASTEROIDS Act* (2014), the precursor to the CSLCA. Pace and Hertzfeld are scholars at George Washington University's (GW) Space Policy Institute, which is sponsored by aerospace giants like Aerojet Rocketdyne, Boeing, Lockheed Martin and more.

In advance of any constitutive act of mineral appropriation taking place, the legal and political status of celestial bodies is being contested in an almost entirely anticipatory arena. Against interpretations to the contrary, I will argue that outer space is a commons. In order to further establish this, I explore the pathway to the OST – the *res communis* ‘space constitution’ – and argue that there is a disjuncture between the authorial intentions of the OST negotiators and recent interpretations from NewSpace lawyers (e.g. Kfir 2016; Marquez 2017). We can thus read NewSpace law as an anticipatory project in neoliberal constitutionalism (Gill 2002; Schneidermann 2013; Purdy 2014). NewSpace’s support of the CSLCA involves a ‘constitutional’ interpretation of the OST in terms that are amenable to space mining, attempting to legitimise state-backed corporate rights *within* an international treaty that places clear restrictions on appropriation. The actors who treat the CSLCA as commensurate with the OST are attempting to sculpt international legal institutions in favour of US corporate interests – in this sense, we can see parallels with other international institutions captured by neoliberal capital, like the World Trade Organization or International Monetary Fund. Drawing on Schneidermann’s (2013) account of neoliberal supra-constitutional law, I speculate on how we may see an entirely different ‘space constitution’ emerge in anticipation of space mining – one which favours first-movers in the space colonisation project.

4.1 The making of the space commons

In this section, I will offer an account of how the OST became the foundation of international space law. The concept of ‘free space’ is a central pillar of the OST: outer space and celestial bodies “shall be free for exploration and use by all States, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies” (Art. 1). The celestial bodies of space are defined as open-access commons in the OST – the Treaty thus inherits the *mare liberum* principle first outlined by Hugo Grotius (2004). ‘Free space’ refers to the absence of national jurisdiction in space and subsequent freedom of passage for all spacefaring parties, and it was first realised as an accepted norm in international space law through US responses to the question of satellite overflight (McDougall 1997; Launius 2000, p.28). This lends some credence to Scott Pace’s claim that it is the first movers “who create the rules and establish the norms in new areas of human activity” (2017, p.4). The broader *res communis* space constitution, however, involved compromise between the US, USSR and developing nations. At the request of the US, the final wording of the Treaty was ambiguous concerning private ownership rights in space (McDougall 1997, pp.417-418). Nonetheless, the terms of the Treaty are still consistent with what we would understand as commons.

4.1.1 Hugo Grotius and *mare liberum*

The *Outer Space Treaty* treats the celestial bodies of outer space as global commons: they lie outside the sovereign borders of any territorially-defined political community and restrictions on their use have been deliberated in democratic fora. UN publications have described global commons as essentially resource frontiers – “natural assets outside national jurisdiction such as the oceans, outer space and the Antarctic” (UN Statistics Division 2016). Each of these global commons have, to varying extents, involved contestation regarding sovereignty and appropriation, largely as a result of creeping state-based jurisdictional claims. For instance, the UN conferences on the *Law of the Sea* in the 1980s eventually recognised state’s rights to extend “their political economic jurisdiction...to 200 nautical miles” off-shore, by which point approximately 30% of the world’s oceans and 95% of global fish stocks had been “enclosed as state property” and exploited through state-appointed commercial fishing

licenses (Mansfield 2007, p.66). As a further example, tradable carbon permits introduce private property into the atmosphere, using state or intra-state mechanisms (in the case of the EU) to introduce markets for pollution rights as a means of reducing pollution in the atmospheric commons. The prospect of geoengineering might raise future challenges to the atmospheric commons, particularly if large-scale modifications are made through technological innovations patented under intellectual property law. The UN's definition above is thus potentially misleading: nation states *have* extended their political reach into global commons in the recent past and are likely to do so in the future.

The legal framework for global commons originates in the earliest days of modern international law, through the *mare liberum* principle developed by Dutch jurist Hugo Grotius in his influential book of the same name (2004).⁸⁰ While *mare liberum* literally means 'the free sea', it essentially describes a legal principle of free passage, unrestricted access and non-exclusive use. Prior to the 1609 publication of *Mare Liberum*, Grotius had been requested by a division of the Dutch East India Company (VOC) to provide a legal opinion regarding the company's seizure of a Portuguese ship as a prize of war. Portugal had claimed ownership of the seas in which the vessel had been captured, and Grotius refuted this with a *res communis* argument. He later remarked in *Mare Liberum*:

"...those things which cannot be occupied or were never occupied can be proper to none because all propriety hath his beginning from occupation. The other is that all those things which are so ordained by nature that anyone using them they may nevertheless suffice others whomsoever for the common use are at this day (and perpetually ought to be) of the same condition whereof they were when nature first discovered them" (2004, p.24).

Those things that could not be occupied could not be owned, and nature "has given *all* things to *all* people" (Baslar 1998, p.31, emphasis in original). Kemal Baslar argues that Grotius had effectively grounded a natural law principle – "that the existence of moral and legal principles acquire their validity and authority from the natural conditions of the existence of humanity, the natural order of the universe or the eternal law of God" (ibid, p.14) – in the norms of state practice, "the positive law of nations rooted in custom and treaties" (ibid, p.31). This is a feat that the *Moon Agreement*, at least, failed to achieve.

⁸⁰ Schmitt's *Nomos of the Earth* points to the birth of international law in antiquity: the 1279BC treaty between the Hittites and Ramses II's Egypt, which Schmitt describes paradoxically as the "first treaty of peace, friendship and alliance" that was also "the founding of a 'dual hegemony' of two empires" that were less peaceful in their imperial expansion into other territories (2003, p.52).

In his argument, Grotius had drawn on the ancient Roman philosopher Cicero to underline that an ethics of fairness and justice was entwined with common property (Grotius 2004, p.24). Cicero positioned common property as central to the moral obligations that maintained society and ‘common bonds’ of justice and charity. In his *De Officiis* (On Duties), Cicero asserted that:

“The first office of justice is to keep one man from doing harm to another, unless provoked by wrong; and the next is to lead men to use common possessions for the common interests, private property for their own” (1913, Book I, VII, para. 21).

Yet *mare liberum* in the global commons has frequently produced inequity and injustice. The international lawyer Nico Schrijver (2016) notes that Grotius’ *mare liberum* concept has significant limitations in practice. Firstly, Schrijver affirms that “Grotius’s argument that the use of oceans was not prejudicial to their use by others would have to be seriously qualified today” (Schrijver 2016). From community-supporting fisheries pillaged by commercial ‘supertrawlers’ to oil spills in heritage listed marine parks, it is clear that one actors’ exercise of *mare liberum* rights can preclude another’s. This is essentially the dilemma described in Garrett Hardin’s ‘tragedy of the commons’ thesis (1968). Secondly, *mare liberum* quickly “digressed into ‘first come, first served’ advantages for industrialised nations” (Schrijver 2016). Both of these issues are likely to play out on the space frontier.

With legal rights to freely use and access global commons comes the freedom to conduct business and to conduct war. In introducing the *mare liberum* principle to the jurisprudence of international commons, Grotius effectively treated the high seas as a "mercantilist, international, inexhaustible space" (Connery 2001, p.178). He did so for the less magnanimous purpose of protecting Dutch national and corporate interests. That the seas were unownable helped secured dominance for the Dutch Empire (1581-1795) and the corporations it had chartered to navigate, trade, establish colonies, raise armies and navies, and wage war – the VOC and Dutch West India Company. The neoliberal think-tank network provides us with a contemporary parallel to Grotius’ work for the VOC. In its latest *Mandate for Leadership* tome for incoming Republican Presidents, the Heritage Foundation has linked US national security with national economic growth, requesting protection of “freedom of movement within the global commons: the sea, the air, cyberspace, and the outer space domains in which the world conducts business” (Heritage Foundation 2016, p.27). There is a tension between opening and enclosing: protecting freedom of movement in global commons

enables the resources within these spaces to be claimed as private property.

4.1.2 From airspace to 'free space': rockets, RAND and the early Cold War

Technological change forces law and politics to play catch-up. Between 1945-57, 'free space' emerged as a precedent in customary international space law. When the V-2 rockets of Nazi Germany reached the edge of the atmosphere during WW2, outer space was an entirely anomic frontier, devoid of norms and rules for its use (though international law did not constrain Hitler's imperial project, in any case). As WW2 ended and the Cold War began, the space technologies of the US and Soviet Union increased in sophistication, and rockets and spacecraft reached further into space.

Space law and the first space lawyers were plagued with uncertainty as to how the off-world should be juridified. Following a 1949 rocket launch that reached a height of 400 kilometres, the international aviation lawyer John Cooper was prompted to ask: "Did it pass out of the territory of the State below when it left the airspace, and re-enter that territory on returning; or was it at all times within the territory of the State below?" (1951, p.414).

Aerospace and communications lawyer Andrew Haley lamented, with an eye to the distant future, that "we have about as clear a vision of the space law that will prevail one or two centuries from now as Hammurabi in the 22nd Century B.C. might have had of our private and public international law of the present day" (1956, p.951).

In addition to maritime law and Roman categories of property, space lawyers of the 1950s also took cues from aviation law. This initially seemed intuitive, since spacecraft needed to pass through the atmosphere before reaching low-Earth orbit, and because spaceflight and aviation were technologically similar. However, legal understandings of national airspace were themselves a work in progress. The juridification of airspace began with the 1919 *Paris Convention Relating to the Regulation of Aerial Navigation* and was further developed with the 1944 *Convention on International Civil Aviation* held in Chicago. The Chicago Convention had stated that, "The contracting States recognise that every State has complete and exclusive sovereignty over the airspace above its territory" (Article 1, cited in Cooper 1951, p.414). Crucially, the Convention had failed to address the vertical limits of this 'complete and exclusive' sovereignty, retaining the vertical expansiveness of the *ad coelum* doctrine (Gangale 2009, pp.10; On the Commons 2007). Interestingly, there is still no internationally recognised definition of the boundary between national airspace and outer

space – the highest altitude that planes or balloons can reach is the effective practical delineation between national airspace and extra-territorial outer space.⁸¹

For the first space lawyers, an infinite extension of sovereignty beyond the atmosphere presented obvious problems: with the orbit of the Moon around Earth, and the apparent movement of planets and stars in the night sky, celestial bodies would pass through copious national jurisdictions below. The space writer Thomas Gangale describes how early scholars of international space law “recognise[d] the absurdity of national sovereignty reaching to infinity, because in such a system a spacecraft would constantly pass through the legal jurisdiction of one subjacent state after another” (2009, p.10). Among the first space lawyers, Oscar Schachter, Alex Meyer and C. Wilfred Jenks argued that the extent of state sovereignty was limited to the atmosphere: ‘airspace’ required air, and outer space “is [thus] a separate legal environment” (ibid, p.11).

‘Free space’ became an accepted norm in superpower relations through the question of satellite overflight. *Mare liberum* or ‘free space’ norms in outer space can be attributed to distinctly un-communal state motivations in the form of high-altitude surveillance. The Eisenhower Administration established NASA in 1958 after the USSR’s *Sputnik 1* (1957) confined the US to the ignominy of second place in the race to launch an artificial satellite into orbit – this event was widely considered to be the spark that started the space race. However, as space historian Roger Launius remarks, “the tantalizing possibility exists that perhaps a part of [US] space policy of the 1950s was predicated on allowing the Soviet Union to orbit a satellite first” (2000, p.28).

This brief yielding of American claims to superiority appears to originate with the RAND Corporation, founded in 1948 by the Douglas Aircraft Company. RAND (short for ‘research and development’) was “a hybrid organisation emerging in the interface between the US Air Force and its avionics contractors” (Granjou, Walker & Salazar 2017, p.8). Eisenhower’s space policy essentially followed the advice provided by the newly inaugurated RAND Corporation in its report, *The Satellite Rocket Vehicle: Political and Psychological Problems* (Kecskemeti 1950; MacDougall 1997). RAND was essentially the “first strategic ‘think tank’” and, according to MacDougall, this report was an anticipatory text of geopolitical

⁸¹ This issue has been on the agenda of the Legal Subcommittee of UNCOPUOS since 1967 (the year the OST was opened for signature). UNCOPUOS’ Working Group on the Definition and Delimitation of Outer Space has sought consensus on this question, as the boundary between airspace and outer space represents the point at which national sovereignty ceases and the “principles of the freedom of use of outer space and of non-appropriation” commence (UNCOPUOS 2020, A/AC.105/769/Add.1, 2).

strategy that “deserves to be considered the birth certificate of American space policy” (1997, p.108).

In the Cold War context, satellite surveillance was considered vital to American national security (Gangale 2009, p.11). The USSR’s state-run media and the travel restrictions it imposed on its citizens limited the US’s capacity for traditional espionage (ibid, p.11). Satellite-based surveillance of the Soviet intercontinental ballistic missile program became an imperative for the US. The RAND report had identified that establishing a legal right to use a reconnaissance satellite was important for avoiding Soviet provocation or retaliation and returned to the issue of airspace that had been unresolved in the 1944 Chicago Convention on aviation. The US had accepted the principles of ‘freedom of the air’, but the USSR had not (Gangale 2009, p.15; MacDougall 1997, p.108). Subsequently, the passage of an American surveillance satellite would likely be construed as a “consummated violation of sovereignty” by the Soviet leadership (Kecskemeti 1950, p.15). This could have prompted Soviet litigation in the International Court of Justice, some degree of armed retaliation or interference in US reconnaissance (ibid, pp.15-17). As a result, it was vital for US military strategy that satellite overflight be made legal: ‘free space’ needed to be established in customary international law. Much like Grotius’ work for the VOC, the RAND report argued that establishing ‘free space’ would help establish America’s military freedoms in the off-world commons. The freedom to conduct military surveillance, in this case.

The RAND report was laced with the anticipatory, predictive language of game theory. Game theory has been an enduring intellectual project for RAND scholars and, through John Nash, a source of the mathematical and behavioural predilections of 20th century neoclassical and neoliberal economics (Mirowski 2002). RAND strategists argued that a preliminary scientific satellite could be used as a trial run while “work on perfecting techniques of receiving and analysing [surveillance] data” occurred simultaneously (Kecskemeti 1950, p.23).

“Our objective is to reduce the effectiveness of any Soviet counteraction that might interfere with the satellite reconnaissance operation before significant intelligence results are secured...Perhaps the best way to minimise the risk of countermeasures would be to launch an ‘experimental’ satellite on an equatorial orbit. Such a satellite would not cross Soviet territory and, hence, would not provide the ‘consummated aggression’ on which effective counteraction could be based...If the results obtained during the test period are satisfactory,

the decision may be taken to launch a second ‘work’ satellite...It would be distinctly advantageous if the second satellite could be kept black [classified]...” (ibid, pp.21-22)

The RAND report argued that the US ought to be first to launch a satellite into space, but this satellite should be for non-military purposes.

US satellite strategy and international norms of freedom of passage in outer space were thus shaped by RAND’s futurological policy brief. In 1955, both the US and USSR had announced their intentions to launch scientific satellites into space.⁸² McDougall describes the ‘free space’ scenario succinctly:

“...there were two ways the legal path could be cleared for reconnaissance satellites. One was if the United States got away with an initial small satellite orbiting above the nations of the earth ‘for the advancement of science’ – and had no one object to it. The other was if the Soviet Union launched first. The second solution was less desirable, but it was not worth taking every measure to prevent” (1997, pp.123-124).

The first option was explicitly advocated by RAND; the second is what materialised with the *Sputnik* launch in 1957. Yet RAND’s intervention had in any case shaped this eventual outcome. The US actually had the capacity to be the first nation to reach Earth’s orbit via a repurposed *Redstone* missile, a short-range ballistic missile designed for the US Army by Werner von Braun’s Huntsville team, with its warhead to be replaced with a satellite (MacDougall 1997, p.122; Gangale 2009). The Department of Defense had established the Stewart Committee in 1955 for the purposes of selecting the US’s first satellite from contending proposals. It had opted for the US Navy’s *Vanguard* program, which had a longer development schedule than the *Redstone* but had been designed largely for scientific purposes. While this might initially suggest that freedom of passage in space was established through peaceful scientific purposes, MacDougall concludes that the Stewart committee had been briefed by RAND and “instructed to keep in mind the importance of a nonmilitary, scientific image for the enterprise...their decision was ideal from the political, if not technical, standpoint” (MacDougall 1997, p.122). *Sputnik* represented a substantial dent in American post-war exceptionalism, but the episode diffused anxiety around the legal basis

⁸² Organisers of the International Geophysical Year of 1957-58 (IGY) had pushed for nations to launch satellites for scientific research. The IGY encouraged participating governments to launch satellites into space in the name of international scientific cooperation – a gesture of scientific diplomacy, predicated on openness and communalism (MacDougall 1997, p.118). It would thus be remiss to treat the emergence of US satellite policy solely as an act Cold War antagonism and distrust.

for satellite surveillance (Launius 2000, p.28). In Gangale's words, "the right of orbital overflight, recognized from the very beginning by the two original launching states and not objected to by any other states, became a customary norm virtually instantaneously" (Gangale 2009, p.13).

For 'official use only' and advocating for classified satellite surveillance, the RAND report exemplifies the uniqueness of space as a commons in a politico-legal sense. The early Cold War diplomatic environment was eclipsed by the superpower rivalry between the US and USSR, with Western Europe rebuilding from WW2 and many developing nations engaged in post-colonial independence movements. The 'global' commons of outer space thus had bilateral origins. The principle of 'freedom of space' became a norm in state practice with the help of classified think-tank research on geopolitical strategy, against a backdrop of swelling military budgets and counter-mobilisations of potential violence (discussed in section 1.1.3).

4.1.3 *The res communis space constitution*

There is, of course, more to global commons than this basic *mare liberum* right to freedom of passage and shared usage. Here, I will briefly re-visit some of the points I raised in chapter 2. Commons are governed through collective decision-making and involve some form of management regime that ensures shared use, a community-wide distribution of benefits – and, crucially – long-term preservation. They are "governed by rules whose point is to make them available for use by all or any members of the society" (Waldron 2016, p.3). Wall notes that "prior to European colonialism, commons were the rule rather than the exception across much of our planet" (2014, p.9). Capitalist private property is aberrant in the deep historical trajectory of social, political and legal relationships between people and their environments (Polanyi 2001, ch.4).

It is fitting, then, that when the first human beings ventured forth into outer space, the Solar System was juridified in international law with *res communis* status. The OST is one of several treaties negotiated in the 1950s-1970s that declared international common rights in global commons and expressed a desire for international cooperation, in response to the ongoing likelihood of inter-state violence. The preamble to the OST reflects the anxieties of the Cold War: negotiating parties noted the desire to use "outer space for peaceful purposes", to "contribute to broad international cooperation in the scientific as well as the legal aspects"

of exploring and using space, and that “such cooperation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and people” (OST 1967, preamble). These sentiments were also expressed in other international laws of the global commons that were ratified after WW2. In 1956, the UN held the first Convention on the *Law of the Sea* (UNCLOS I). This began a process of formalising and codifying principles of non-territoriality and free passage in international waters that had been established customarily over centuries. In 1959, the first *Antarctic Treaty* was ratified; it declared that “No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force” (Antarctic Treaty 1957, Art. 4).⁸³

This period marks a trend towards international laws of cooperation, and multilateral efforts at constraining unilateral state actions in global commons. The post-war phase of international law contrasts with the eras of colonial and world wars, which were characterised by laws of mere co-existence rather than cooperation (Fassbender 2003). Outer space was juridified through the post-Westphalian political community of the United Nations, during the post-WW2 movements towards globalisation. It has always been a fragile community and was embroiled in East-West divisions for over 3 decades (post-colonial movements and the NIEO introduced an additional North-South divide). The OST nonetheless emerged from a movement away from “an essentially negative code of rules of abstention to positive rules of co-operation” that the international community had deemed necessary in the wake of global conflict (Freidman, cited in Fassbender 2003, p.118).

The space commons were juridified during a succession of agreements between 1958 and 1979. These were initially negotiated as bilateral affairs between the US and USSR but progressed into UN General Assembly resolutions which, in turn, were eventually amalgamated into the articles of the OST. The negotiation of the OST was foreshadowed by nuclear non-proliferation agreements, which began with Eisenhower’s 1953 ‘Atoms for Peace’ speech to the UN General Assembly and the formation of the International Atomic Energy Agency in 1957. These concerns about the nuclearisation of space would be articulated in prohibitions ratified under the OST. In 1958, Eisenhower had instigated bilateral talks with the USSR, proposing “an agreement to prevent an arms race in space and

⁸³ However, a key point of difference between the *Antarctic Treaty System* and the OST is that the existing Antarctic territorial claims of select nations are recognised, rendering it less restrictive than the OST.

assure that space be used for only peaceful purposes” (Cooper 2003, p.111).⁸⁴ Later that year, the US and USSR presented guiding principles of peace and ‘common interest’ to the Thirteenth Session of the United Nations General Assembly. The Assembly subsequently recognised “the common interest of mankind in outer space” and “that it is the common aim that outer space should be used for peaceful purposes only”, with the desire to “promote energetically the fullest exploration and exploitation of outer space for the benefit of mankind” (U.N. General Assembly 1958, Res. 1349, preamble). This Resolution also led to the establishment of the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which continues to oversee the implementation of and adherence to space treaty law today.

The path towards a multilateral space accord that featured the non-appropriation principle was beset with bilateral antagonism and anticipatory geostrategy, much like customary rights of free passage. In 1961, a *Resolution on International Cooperation in the Peaceful Uses of Outer Space* was adopted by the General Assembly. It extended “international law, including the Charter of the United Nations, to outer space and celestial bodies” and – presaging Article 2 of the OST – proclaimed outer space and celestial bodies to be “free for exploration and use by all states in conformity with international law and are not subject to national appropriation” (U.N. General Assembly 1961, Res. 1721). Cooper notes that President Johnson “took up the issue [of an international space treaty] in order to forestall Soviet placement of nuclear weapons in space or claims to celestial bodies” (2003, p.111). The United States supported the non-appropriation principle as a way of preventing Soviet territorial claims to the Moon, should they arrive there first (which had seemed likely in the early 1960s).

In July 1966, the OST was negotiated in the Legal Subcommittee of UNCOPOUS convened in Vienna. The US actively pursued a non-committal wording of its *res communis* elements. The Treaty’s final wording reflected a compromise between the space superpowers, and seemingly between the US and the rest of the world. The United Arab Republic (now

⁸⁴ Article 4 of the OST prohibits placing “in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction” or placing these weapons on celestial bodies or space stations. So much for Werner von Braun’s suggestion that a space station could be “an extremely effective atomic-bomb carrier” (cited in Kilgore 2003, p.68). Article 4 also prohibited the “establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies”. Project Horizon, the lunar military base proposed to the US Army (by von Braun’s Army Ballistic Missile Agency), would have been illegal. As would creating ‘asteroid forts’ for anti-ballistic missile defences, one of many “wild speculations” proposed by Keith Henson, co-founder of the L-5 Society (1979, p.1).

Egypt) proposed amendments to Article 1, such as the following qualification to the ‘benefit to all mankind’ provision:

“States engaged in the exploration of outer space undertake to...provide possibilities to the non-space Powers, to enable them to participate in and to draw benefit from the exploration and the use of outer space for the aim of deriving practical benefits related to their economic and social development.” (U.N. Committee on the Peaceful Uses of Outer Space, 1966, p.6)

Other countries had pushed for more general recognition that spacefaring should be ‘for the benefit of all mankind’, such as Brazil (MacDougall 1997, p.416). The US State Department had instructed its UN Ambassador Arthur Goldberg “to avoid raising the issue of ownership of lunar resources” (ibid, p.416). MacDougall reports that the US “acceded to [the more general wording] so long as specific references to property or economic rights were excluded” (ibid, p.417). Goldberg testified before the US Senate ahead of the Treaty’s ratification by the US in 1967. Senators were concerned about what concessions America was making to the world – property is about power, ultimately. Goldberg reassured them that the Treaty made only vague commitments to delivering benefits to non-spacefaring countries – this was a “goal subject to further refinement” (in MacDougall 1997, p.418). The US position on the OST effectively opened the door towards private property legislation like the CSLCA, while also prompting developing nations to seek codification of ‘benefits to all mankind’ in later sessions of the General Assembly. These codifications would be proposed a decade later within the *Moon Agreement*, which the US state would also reject.

In spite of these points of contention that arose during negotiation, the OST was widely ratified when opened for signature in 1967. The OST is, in Marboe and Johnson’s words, “aspirational in nature, forward-looking and expansive”, in that it envisioned a unique legal environment in which benefits from use should extend to nations incapable of reaching space (in IISL 2016, p.28, p.29). It has been described as ‘quasi-constitutional’ in binding State parties to a foundational set of principles for the governance and use of outer space (Gabrynowicz 2004, p.1042). Constitutional theorist Wil Waluchow describes how constitutions are distinct from common law because, although both laws and the constitutions from which they derive place restrictions on behaviour, constitutions are “heavily entrenched” in a society’s political and social life and are meant to provide “continuity and stability in the basic framework” of law-making and policy (2017, p.24). Robinson and White (1986) have emphasised the OST’s declaration that astronauts are the “envoys of mankind”

(1967, Art. 5) and thus suggest the OST ought to serve as a literal constitution for potential space societies. The constitutional nature of the OST is further highlighted by the fact that, as Gabrynowicz recounts, “President Lyndon Johnson believed that the Outer Space Treaty was important enough to the United States national interests to ask then Supreme Court Justice Arthur Goldberg to step down from the Supreme Court in order to negotiate it for the United States” (2004, p.1042).

The OST effectively ‘constitutes’ – in the sense of bringing together or giving form to – an international community vis-à-vis the use and exploration of outer space. Global commons like outer space involve what legal theorist Hans Kelsen (1967) called a *grundnorm*: a ‘basic norm’ or underlying order from which subsequent norms derive. The *grundnorm* of international law has generally presumed state sovereignty as the basis of membership in the international community; the United Nations (1945-present), like the League of Nations before it (1920-1946), is “composed of states whose membership is in turn defined territorially” (Philpott 2014, p.4). This is reflected in the *Outer Space Treaty* (OST), which is an instrument of international public law and is ratified by ‘State Parties’. Precisely what this political community is bound to under the terms of the OST has been highly contested with the emergence of space mining start-ups and the passage of domestic space resources law.

4.2 Neoliberal constitutionalism

The principles of the OST focus on freedom, common interest and non-appropriation, strongly suggesting that outer space has the legal status of a global commons in international law – regardless of whether the term ‘global commons’ appears in the Treaty itself. However, as we discussed in Chapter 2, property is a social relationship and there are never empirical or immutable ‘facts’ on what is or is not common property. To declare the mineral resources of space to be either communally owned or open for private or national appropriation invariably involves political claims and strategies. Viewing space mining through the lens of ‘mineral sovereignty’ illustrates that the act of making laws is an expression of power – a power that is unevenly distributed, given the hierarchies of political power both within and across nation states (Chapter 3). In this section, we will further explore how the ‘rule of law’ can be ambiguous, particularly in light of the varying interpretations of the OST’s terms (as has been the general focus of space law scholarship on the CSLCA).

NewSpace actors need the CSLCA to be accepted as consistent with international law in order to attract investment, and have subsequently formed interpretations of the OST that portray private, state-backed extractive rights as commensurate with the laws of the space commons (Kfir 2016; Marquez 2017). I will illustrate here that these arguments rest upon generous interpretations of the OST that obfuscate its terms and intentions, and will make the case that NewSpace interpretations of the OST are analogous with what has been described as neoliberal constitutionalism (Gill 2002; Purdy 2014). As Schneidermann has characterised neoliberal constitutionalism, “democracy is not to be trusted in economic matters” (2014, p.2). I will here extend the concept of representative democracy beyond the confines of the nation state and into the diplomatic and legal fora of the United Nations. The neoliberal constitution undermines or rivals the legal order of the United Nations and its democratic capacity for multilateral decision-making. Pro-CSLCA arguments are re-framing the terms of the OST such that private extractive rights appear permissible; this, in turn, creates a legal argument for any country that wishes to follow the US in the future. Much like the social democratic ‘constitution’ envisioned under the *Moon Agreement*, the OST could be swept aside – ushering in a new international neoliberal ‘space constitution’ outside the democratic chambers of the UN or its members states.

4.2.1 Interpreting the Outer Space Treaty

In viewing international space law through the lens of constitutional theory, we return to the ‘strong state, free economy’ double truth of neoliberalism, manifest in the specific case study of NewSpace. Constitutionalism is a philosophical, moral and political belief that government power or sovereignty should indeed have limits placed on it, “and that its authority depends on its observing these limitations”, be they formal charters of civil rights, procedural mechanisms that shape how that power is exercised, or other ‘checks and balances’ that separate legislative, executive or judicial power (Waluchow 2017, p.3). In the OST, the limitations on state sovereignty are made abundantly clear with the non-appropriation principle (Art. 2) and the anti-militaristic precepts of Article 4, among others.

In light of the CSLCA, NewSpace might appear to be in a predicament: do they support the limitation of government sovereignty in international space law (in keeping with their rejection of government authority in commercial spacefaring), or do they endorse an extension of US state sovereignty into the global commons so that their private property claims can be recognised under US law? As Carl Friedrich surmised during the first decade of the neoliberal Chicago School of law and economics, neoliberalism sees the state “as a central source of authority; yet at the same time, the state must not interfere in all kinds of [business] activities” (1955, p.512). The projection of state power into the global commons is commensurate with NewSpace’s understanding of liberty, so long as state authority enhances rather than curtails the ability of space miners to extract from the commons.

‘Neoliberal constitutionalism’ is evolving in legal-political practice. We have discussed Hayek’s notions of limited democracy (section 1.1.1) – that the rule of law should protect individual liberties and rights to own private property (as defined in liberal constitutions) from extensions of democratic power (such as the constitutionally-defined power of a state to raise corporate taxes, or the freedom of assembly as expressed through union demands for wage increases). The jurist Joseph Raz notes that the ‘rule of law’ had traditionally signified that “people should obey the law and be ruled by it”, but a Hayekian interpretation leads to:

“a narrower sense, that the government shall be ruled by the law and subject to it. The ideal of the rule of law in this sense is often expressed by the phrase ‘government by law and not by men’” (Raz 1979, p.212).

As discussed above, we can detect hints of a Hayekian constitutionalism in Moon Express CEO Bob Richards' plea that the "U.S. government should in principle enact laws that assure freedom of enterprise in space, making it illegal for the government to deny or restrict private sector space activity" (2017, p.4).

Here I will broaden my discussion of an embryonic 'NewSpace constitutionalism' to focus on the role of constitutional interpretation in fortifying corporate economic rights. Scholarship in neoliberal constitutionalism has recently focused on select US Supreme Court decisions (Purdy 2014; Teachout 2014; Brown 2015), in particular *Citizens United v. Federal Election Commission* (2010).⁸⁵ In the *Citizens United* case, constitutional rights to free speech were effectively extended to corporations investing in political campaign spending. The Supreme Court majority deemed that restricting the amount a corporation could spend on political advertising represented an unconstitutional restriction on corporations' alleged freedoms of 'political speech'. Arriving under the conservative Roberts Court, these decisions have involved doctrinaire neoliberal interpretations of the Bill of Rights. In Jedediah Purdy's words, these decisions "constitutionally protect certain transactions that lie at the core of the economy" and make "unequal economic power much harder for democratic lawmaking to reach" (2014, p.202). Precedents were also established during the Gilded Age of economic liberalism, in the *Lochner v. New York* (1905) case.⁸⁶ Neoliberal constitutionalism attempts to insulate the market from democracy – expanding "a set of available constitutional arguments" that would support future Supreme Court decisions (Purdy 2014, p.208).

Are the NewSpace arguments surrounding the CSLCA creating new 'constitutional' arguments that will legitimise and protect corporate extractivism in the space commons in the future? In approaching this question, I will consider the 'originalist' and 'living' schools of constitutional theory (Waluchow 2017). An originalist interpretation of the OST would treat it as 'fixed' in its positing of a set of non-negotiable moral and political commitments. In Waluchow's words, originalist interpretations seek to:

⁸⁵ The *Citizens United* decision deemed corporations' political advertising and donations to be acts of 'political speech', thus protected under the First Amendment rights to freedom of speech. It meant that "for Congress to limit corporate campaign spending was just as unconstitutional as banning a flesh-and-blood person from arguing for or against health care reform" (Purdy 2014, p.199).

⁸⁶ The *Lochner* decision ruled invalid a state law that had set maximum daily and weekly hours for bakers on grounds that it "violated constitutionally protected 'liberty of contract', the freedom of employees to make whatever agreements they saw fit" (Purdy 2014, p.196).

“replace controversial moral and political questions with historical questions about the intentions of constitutional authors in creating what they did, or about how the language they chose to express a constitutional requirement was publicly understood at the time it was chosen” (Waluchow 2017, p.14).

Living constitutionalism, meanwhile, argues that constitutions require evolving interpretation to suit changing social, political and economic circumstances.⁸⁷ The OST is a product of the Cold War and some have subsequently considered it anachronistic in the new era of commercial spacefaring (even though the state remains a key player in the contemporary space economy). For example, Planetary Resources’ Peter Marquez argues that the OST should be interpreted in light of “evolving circumstances” such as the emergence of space mining start-ups – largely because a US withdrawal from the OST or pursuit of amendments to it would increase uncertainty for potential investors in the space mining industry (Marquez 2017, p.4; see also Dunstan & Szoka 2017). Both the originalist and living schools of interpretation are at play in NewSpace arguments in favour of the OST, however a ‘living’ interpretation is dominant. As with the *Citizens United* decision and the elision of constitutional rights to free speech with political campaign advertising, NewSpace constitutional interpretations warp the terms of the OST and distort their intended meaning.

Space miners have made selective ‘originalist’ interpretations of the OST. Marquez says that “it is the unbroken consistency of the United States’ interpretation of the Treaty...that is the key to our credibility in [introducing the CSLCA]” (2017, p.3). Much like Scott Pace’s comment that “the United States has consistently taken the position that these ideas do not describe the legal status of outer space” (2017, p.4), Marquez essentially prioritises the authorial intentions of US negotiators and subsequent Congressional interpretations of the Treaty over those of other national delegations, as though the US was sole judge on a treaty ratified by most of the world. Dunk notes that the USSR “was squarely against any private activities in most economically relevant areas of society, but certainly so in an area of such strategic concern as outer space” (2011, p.1). Space lawyers have also pointed to comments made by the Belgian delegation in the OST’s *travaux préparatoires* (Pop 2000, p.176; Tronchetti 2009, p.199; Jakhu, Pelton & Nyampong 2017). Tronchetti identifies that the Belgian delegate had “stated that notice had been taken of the term ‘non appropriation’ advanced by several delegations” that it effectively covered and prohibited

⁸⁷ Living constitutionalism is undeniably important in some areas, such as Supreme Court decisions that overturned the right to own slaves.

“both the establishment of sovereignty and the creation of title of property in private law” (Tronchetti 2009, p.199). The OST’s final wording – a comprehensive prohibition on “national appropriation by claim of sovereignty, by means of use or occupation, or *by any other means*” (Art. 2, emphasis added) – would support an originalist interpretation *against* the legality of the CSLCA.

CSLCA supporters have also attempted to present ‘evolving’ interpretations of the non-appropriation principle by shifting the focus onto the distinction between celestial bodies and minerals extracted from them (Kfir 2016; Perry 2017). Space miners are not seeking ownership of Mars, the Moon or a particular asteroid – only the minerals contained therein. Nor are they claiming ‘land grabs’ through the CSLCA. If we read the OST’s Article 2 literally – “outer space, including the Moon and other celestial bodies, is not subject to national appropriation” – it is outer space *in its totality* that is not subject to appropriation, including the resources contained within those celestial bodies. This logical interpretation is ignored, and an analogy between space mining and fishing is proffered by NewSpace lawyers instead. The following example is from Kfir:

“Much like fishing trawlers going to sea, the fishermen have the right to keep the fish that they catch, but have no ownership rights to the sea itself. Similarly, the U.S. space resource utilization industry is not claiming any ownership or right to the asteroid or space resource itself, just the right to retain the material extracted from such resources” (2016).

Hugo Grotius’ defence of the unownable nature of the oceans is also invoked in defence of space mining – that “the sea is the common property of all, but that fish are the private property of him who catches them” (Grotius, cited in Perry 2017, p.6). It is a problematic analogy. Grotius’ proclamation of the common status of the seas rested upon the assertion that “those things which cannot be occupied...can be proper to none” because “all propriety hath his beginning from occupation” (2004, p.24). How could exercising mineral rights – a body of law associated with 99-year leases and irreversible alterations to the physical environment – be anything other than a claim to property through occupation? The analogy with the law of the ‘free seas’ only goes so far: surely asteroids are closer to ‘islands’ in the interplanetary ‘seas’. Mining operations on asteroids or larger celestial bodies (planetoids, moons and planets) would inevitably constitute semi-permanent occupations of physical space not unlike terrestrial mines. Likening space resource extraction to fishing represents an attempt to conceptualise a form of mining that is void of occupation.

It is important to move beyond this ‘constitutional’ analogy and the ‘evolving’ or ‘originalist’ schools, and look to the widely accepted provisions on treaty interpretation contained under the *Vienna Convention on the Law of Treaties* (1969, Art.31). As Marboe and Johnson note, the draft texts and records of negotiation contained in OST *travaux préparatoires* “are only supplementary means of interpretation” (in IISL 2016, p.27). The *Vienna Convention* states that treaties “should be interpreted in good faith in accordance with the original meaning to be given to the terms of the treaty in their context and in light of its object and purpose” and that this interpretation should include the whole text of the treaty, “including its preamble and annexes” (VCLT 1969, Art.1, para. 1-2). It is undoubtedly true that, in order for treaties’ aims to be comprehensively realised, ratifying nations often need to pass domestic law that codifies their citizens’ responsibilities under these treaties (a key example being ineffective domestic implementations of international de-carbonisation targets of the Kyoto and Paris agreements). Establishing “a domestic legal framework is a concrete method to give effect to a state’s international treaty obligations” and a nation’s interpretation of the OST is an intractable element in this process, in lieu of binding international legal instruments that explicitly regulate space mining (Marboe & Johnson in IISL 2016, p.34). This is often the basis for NewSpace arguments in favour of the CSLCA. Sagi Kfir, Deep Space Industries’ General Counsel, notes that each nation “has the right as a sovereign nation to interpret and implement its treaty rights on a national level” (Kfir 2016). Szoka and Dunstan of TechFreedom, a relatively new Atlas think-tank, take this interpretive logic further: “Effective space property rights are not only consistent with international law, they are *required* by it” (2015 p.1, emphasis in original).

Yet state practice in interpreting the OST and questions of what constitute a ‘good faith’ interpretation underline the fact that international law – like the concept of sovereignty itself – is also a contestable socio-political construct. A sizeable interpretive jump is being made in the arguments that domestic implementation of the OST necessarily involves the recognition of private mining rights. It is true that the ‘province of all mankind’ wording of the OST’s preamble and Article 1 clearly leaves much open to states’ interpretation – as was the intention of the US’s OST delegation, who had ensured that a discussion of off-world property and other economic rights did not inform the Treaty’s negotiations (MacDougall 1997, pp.416-418). The Institute for International Space Law have recently remarked that the “formulation that the use of outer space and celestial bodies shall be ‘the province of mankind’ raises difficult questions in the legal assessment of outer space”, given that “the

Outer Space Treaty nowhere explains this concept” (Marboe & Johnson, in IISL 2016, p.32). However, it is also widely accepted in legal scholarship that the articles of international treaties should not be read in isolation but in conjunction with each other (as per the *Vienna Convention*). Space is ‘the province of all mankind’ and the right of State Parties and their corporate entities to freely ‘use and explore’ outer space is clearly limited by the non-appropriation principle (see, for example, Hobe & de Man 2017, p.463). The inverse is also true: for whatever disagreement exists about the extent of the non-appropriation principle (Art. 2), any use of off-world resources should work towards ‘benefits to all mankind’ (Tronchetti 2015, p.8; IISL 2016, p.41).

There are several areas in which a holistic reading of the OST renders the CSLCA highly problematic. For a time, proponents of off-world private property rights had attempted to demarcate national activities in space from private activities in space, arguing that Article 2 presented a loophole for private appropriation (e.g. Lunar Embassy 2019b). Article 6 of the OST puts paid to this idea:

“States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty” (OST 1967).

National governments would be responsible for the conduct of any of their space mining companies, thus binding space miners to the same principles that states are bound to uphold. Freeland notes that this “includes an adherence to the fundamental principles associated with non-appropriation of outer space” (2017).⁸⁸ Article 6 effectively negates the need for a history of mineral sovereignty, since it implies that space miners would also be prohibited from acts of appropriation. A presentation from Brian Israel (a former State Department

⁸⁸ Much to the chagrin of select NewSpace quarters, this means that all launches and activities are subject to government approval. For instance, Moon Express was recently granted ‘mission approval’ to land on the Moon by the Federal Aviation Authority. In lieu of any equivalent ‘spacefaring authority’, the FAA oversees the activities of American private space corporations in tandem with the Federal Communications Commission (regulating commercial satellites) and the National Oceanic and Atmospheric Administration (regulating remote sensing satellites, such as those recording climatological data), all of which ensure the compliance of US’ public and private space activity with the OST (SFF 2019). The Space Frontier Foundation subsequently bemoaned the need to get permission to go to the Moon: “Long term, this is not an ideal solution, and Congress will need to develop law that codifies a process that is simpler than what Moon Express had to use” (SFF 2019). The author argues in support of “an in-space or on-orbit authority whose mandate covered all of space including surface activities on planets, active interactions of docking spacecraft and so on” (SFF 2019). A neoliberal model of re-regulating in favour of the market, rather than de-regulating (Cahill 2014).

official who is now legal counsel to Planetary Resources) to the COMSTAC working group noted that “fixing the Article 6 problem is crucial” to US private property law for space resources (in Kundstadter 2014).

Further points of contention arise from the case of asteroid mining and the *mare liberum*-style provisions of the OST. The distinction between an asteroid and a mineral resource is perhaps ambiguous. The Treaty or the CSLCA offer no clarity as to whether there are lower limits to what constitutes a celestial body. Is a smaller asteroid with a 500-metre diameter just a large chunk of unprocessed ore drifting through space? It is plausible that space miners could extract one mineral from a small asteroid and discard regolith or other minerals that were not useful or profitable, akin to terrestrial mining’s removal of ‘overburden’ like soil and vegetation. Except, in asteroid mining, this extraneous debris and dust would be dispersed into the vacuums of outer space. An asteroid could be mined of one mineral to the extent that its mass was reduced and its entire structure altered. As cited above, Freeland offers one hypothetical scenario that space mining may produce – that these small celestial bodies could be “mined ‘out of existence’” (2017). Returning to the Grotian line of argument, extracting fish from the sea does not *necessarily* involve radical, material changes to the sea itself. Is mining an asteroid for all its resources an acceptable exercise of a NewSpace firm’s *mare liberum* rights, given that a later scientific mission (studying asteroid composition, say) could be prevented from exercising their *mare liberum* rights? If there “shall be free access to all areas of celestial bodies” (OST 1967, Art. 1), would a space mining firm pack up its multibillion-dollar infrastructures and vacate a celestial body so a rival company can similarly make use of it? The CSLCA’s supporters have avoided these questions.

In addition to Earthly parallels in the ‘freedom of use’ provisions that have informed the legal status of the high seas, the OST describes outer space as a unique legal environment that is predicated on common interest, co-operation and benefits to all humankind. Scholars with the International Institute of Space Law have duly noted that, “These purposes of the treaty reflect *the spirit of the law*, which is just as important as the letter of the law” (Marboe and Johnson in IISL 2016, p.29, my emphasis). It is problematic, then, that NewSpace interpretations of the OST’s ‘freedom of use’ provision have descended into anachronism and invoke the pre-UN era of ‘strong state’ unilateralism in the high seas (e.g. White 1998; Wasser & Jobs 2008, p.47; Kfir 2016). For example, Kfir states “it is abundantly clear that no international space law or treaty explicitly prohibits the commercial use and extraction of

space resources” (Kfir 2016). There is nothing that explicitly endorses it either – only the general right to ‘use’ outer space. The lawyers and scholars who claim that states can interpret treaty commitments as they see fit are essentially evoking an era of international law predicated on the sovereign independence of nations, as Jakhu has argued (2006, pp.41-44).

Doing so is at odds with the principles of state self-limitation that permeates most of the OST and the political climate that it emerged in (Fassbender 2003). Hobe and de Man (2017, p.466, footnote 33) note that ‘permissive’ arguments that a state would have jurisdiction over off-world space resources appear to involve problematic interpretations of the 1927 *Lotus* case in the Permanent Court of International Justice (the judicial branch of UN precedent, the League of Nations).⁸⁹ The ‘lotus principle’ that emerged from this case has been interpreted to mean that “all that is not prohibited is permissible” – or that “in the absence of a clear normative proscription the state whose conduct is being reviewed should retain some freedom of action” (Shany 2005, p.912, p.925). This decision was contentious at the time and is considered problematic in contemporary legal opinion on space resources law (Jakhu 2006, p.41; Hobe and de Man 2017). More importantly, citing case law that predates the United Nations is discordant with an international legal framework that, at least in principle, is predicated on co-operative deliberation on and negotiation of the rules of the space commons. It is self-defeating to invoke the ‘lotus principle’ while arguing that the CSLCA complies with UN treaty law.

There are further areas in which viewing one article of the OST in isolation engenders interpretations that are against the ‘spirit’ of the Treaty. NewSpace discourse is littered with invocations of common interests, common needs and common destinies, from O’Neill’s (1977) grandiose salvationist project through to Planetary Resources’ claim that it intends to “expand humanity’s resource base” (Lewicki, in Planetary Resources 2012). Whether well-intentioned or disingenuous, NewSpace cosmopolitics is frequently vague as to how the benefits of space resource exploitation would actually reach all humankind. Arguments that space mining projects predicated on private property law are in service of ‘all mankind’ generally point toward ‘positive externalities’ (Kfir & Perry 2017, pp.165-166) or some

⁸⁹ In 1926, the French *SS Lotus* collided with the Turkish *SS Boz-Kourt* in international waters, killing 8 people aboard the *Boz-Kourt*. When the *Lotus* arrived in Constantinople, criminal proceedings were launched by Turkish officials against the vessel’s French captain. The French and Turkish Governments asked the Court whose jurisdiction the vessel’s owner should be tried under – was it legal for the captain to be tried under Turkish law? French lawyers in the Court had tried to argue that they should retain jurisdiction over a vessel bearing the French flag, yet the Court decided in Turkey’s favour that there was no principle in international law to that effect, therefore Turkey’s actions were permissible (*S.S. Lotus (Fr. v. Turk.)*, 1927 P.C.I.J.).

commercially available ‘spin-offs’ for the rest of society (Marboe & Johnson, in IISL 2016, p.35). Kfir and Perry argued that benefits for humanity might flow indirectly once “space resources technology allows the cost of operations in space to decrease” – such as using off-world propellant refineries to reduce the cost of rocket launches – thereby allowing “space exploration [to fit] within the budgets of many more countries than it does at present” and “[adding] to the total stock of resources available to humanity” (2016, p.166, p.167). In order to provide benefits from private mining rights to non-spacefaring countries, space mining firms may one day establish partnerships with developing nations, offering them a stake in profitable ventures or reduced prices for off-world propellant.⁹⁰ However, the language of ‘positive externalities’ resonates with how neoliberalism often frames the question of alleged societal benefits for pro-corporate economic reform. Grow the cosmic pie, and the benefits will surely trickle down like starlight... Yet the whole purpose of private resource rights, in the words of NewSpace corporations, is to enable companies to “enjoy the fruits of their labor” rather than to share them with others (Bigelow, cited in Foust 2013). Moreover, there is an evident tendency in the American space industry towards monopoly power, and a tendency in American foreign policy to put national or US-based corporate interests first. It is difficult to imagine how private resource appropriation in the off-world might in practice deliver ‘benefits to all mankind’.

If we return to the ‘OST as constitution’ analogy, Waluchow notes the risk of ‘living’ constitutional interpretations. They can render

“all talk of constitutional interpretation, properly understood as the retrieval of existing meaning, utterly senseless: constitutional interpretation becomes nothing more than unconstrained, constitutional creation or construction masquerading as interpretation” (2017, p.26).

While there are limits to analogising international treaty law to a national constitution, the way States interpret and implement treaty obligations can serve to establish ‘precedent’ in subsequent interpretations. In international law, this is different to *stare decisis* precedent that

⁹⁰ Similar agreements have emerged in the case of seabed mining, as per the ‘common heritage’ mandate of exploratory licenses granted by the International Seabed Authority (discussed in section 3.2.3). One example is the Canadian start-up Nautilus Minerals, which made plans to mine deposits of valuable minerals off the coast of Papua New Guinea. In 2014, the PNG government had purchased a 15% stake in the company’s proposed Solwara mine (Kero 2014). While this is only one example within a similarly nascent and speculative mining industry, it perhaps serves as a cautionary tale for any developing nation seeking partnerships with start-ups of the global North. In 2019, Nautilus filed for bankruptcy, rendering a return on the national treasury’s \$115 million investment unlikely (Kero 2014; Stutt 2019).

guides common law jurisdictions (such as in the US Supreme Court decisions discussed above).⁹¹ Space lawyers Masson-Zwaan and Palkovitz assert that national laws like the CSLCA may neither “promote or prevent” the development of international space law, but they nonetheless acknowledge that “the adoption of national laws...undoubtedly can have the effect of producing ‘state practice’ and ‘*opinio juris*’ on existing or perceived gaps in international law”, and thereby “may form international customary law” (2017, p.5).⁹²

State practice in interpreting and implementing treaties can be significant in informing future treaty interpretations. This, in turn, guides the evolution of the principles of customary international law that – in a legal positive sense – bind all countries. ‘Soft law’ instruments are also an aspect of state practice that guide the evolution of customary international law: this includes declarations, resolutions and codes of practice. Statements and submissions by national delegations within UN committees are also indicative of state interpretation of the OST and state acceptance of the CSLCA (Masson-Zwaan & Palkovitz 2017, p.5). Other states’ non-acceptance of the CSLCA is significant in this regard. In the 2016 meeting of UNCOPUOS’s Legal Subcommittee, Russia has accused the US of violating the non-appropriation principle, while Belgium expressed concern regarding the potential for global economic inequality to be exacerbated by space mining (Masson-Zwaan & Palkovitz 2017, pp.14-15). Tronchetti and Liu also note opposition from Belgium, Germany and Russia in the 2017 Legal Subcommittee meetings (2018, p.430, footnote 4). Greece and Belgium have recently proposed the creation of a working group committed to devising an international regime for space resource utilisation – including the assertion that “Outer space is a common space regulated by international law” (UNCOPUOS 2019, A/AC.105/C.2/L.311, p.2). This could be indicative of an overall ‘counter-movement’ towards international cooperation in the development of an international regime for space resource exploitation, predicated on realising tangible benefits for ‘all mankind’ and the preservation of multi-lateral consensus-making in space law (this is discussed further in section 6.2.1 below).

⁹¹ The legal principle of *stare decisis* (literally, ‘to stand by decisions’) refers to the judicial practice of precedent. It is the foundation of adjudication in the domestic courts of common law jurisdictions, yet legal precedent is still significant in the arbitration courts of international law (e.g. Bhala 1990).

⁹² *Opinio juris sive necessitatis* (usually translated as ‘opinion of law or necessity’) represents the belief that an action was undertaken as a legal obligation, such as the view that states are obligated to introduce their own resources law for outer space.

However, the Luxembourg space resources law can be read as an effort to build upon the precedent established by the US – that codifying ‘freedom to use’ in national law as the freedom to privately and irreversibly extract from outer space is an interpretation of the OST that is accepted in state legal practice. Linking ‘free use’ with ‘exclusive occupation’ becomes a legal argument that could be used by other states to justify their own laws of appropriation. Or, if other states support the measures taken by the US and Luxembourg, new national laws could be implemented by the US that take private property claims even further – off-world land grabs, for instance (see also p.85, footnote 50). The actions of the first movers in space resources law could well serve to legitimise the actions of additional nations – such as the US’s superpower rivals like China or Russia – similar to how the Soviet launch of *Sputnik* cleared the pathway for freedom of passage in orbital flight. There are thus parallels between ‘NewSpace law’ and legal scholarship in early modern Europe. Scholars like Grotius, Francisco de Vitoria and Alberico Gentili probed ancient Roman law in order to find ways of justifying imperial expansion (Benton & Straumann 2010). More than just conquest, it was an attempt at ‘acquiring empire by law’ (Benton & Straumann 2010). Here, we reach the boldest declaration on the OST’s meaning, contained within the recent *American Space Commerce Free Enterprise Act of 2017*: “Notwithstanding any other provision of law, outer space shall not be considered a global commons” (ASCFE 2017, s.80308). Endorsed by the same politicians that co-sponsored the CSLCA and lobbied for by space mining firms, this recent legislation appears part of a concerted and persistent effort to undermine the commoning of outer space envisioned in UN treaty law, as a way of supporting future acts of enclosure.

4.2.2 Neoliberal multilateralism v. the common heritage of humankind

“The preservation of an effective competitive order depends upon a proper legal and institutional framework. The existing framework must be considerably modified to make the operation of competition more efficient and beneficial” – draft principles of the Mont Pèlerin Society (cited in Plehwe 2009, p.23).

We have discussed the ascension of neoliberal economic policy in the late-1970s and 1980s. Neoliberal capture of mineral sovereignty has involved the corrosion of democratic law-making and the deployment of the state’s legal, administrative and coercive functions to legitimise and protect private access to national and global mineral estates. In this section, we will briefly return to the limited ratification of the *Moon Agreement* and what the CSLCA may mean for future multilateral projects. If the CSCLA-friendly interpretations of the OST are effectively acts of ‘constitutional’ creation “masquerading as interpretation” (Waluchow 2017, p.26), then the US’s refusal to sign the *Moon Agreement* was, to use the words of the Mont Pèlerin Society’s draft principles, the ‘considerable modification’ of an international framework envisioned by the New International Economic Order (NIEO).

I have argued that the US rejection of the *Moon Agreement* and the NIEO was an example of neoliberal ‘strong state’ support for privately-held mineral rights in the global commons. In recent decades, neoliberal think tanks and NewSpace organisations have both painted the *Moon Agreement*’s ‘common heritage’ provisions as ideologically anathema to the market society envisioned by neoliberalism. If “[private] property is explicitly banned”, says a Cato Institute white paper, then the “model for this Treaty is the old Soviet constitution” (Hudgins 1998, p.3). The National Space Society, meanwhile, lamented that the *Agreement* would have created “a centralized, government-managed economy dedicated to distributing any benefits or profits from space resources’ to nations other than the United States” (NSS 2009, p.4). This was the intention of the *Moon Agreement*, and for this reason it has not been ratified by the United States. Russia, the UK, Japan and most other nations followed suit. Under the Trump Administration, the United States has renewed its opposition to the *Moon Agreement*; a recent Executive Order has warned the international community that “the Secretary of State shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law” (Executive Office of the President 2020).

An NIEO constitution for the off-world failed. Stephen Gill was the first scholar to describe a ‘new constitutionalism’ of neoliberal globalisation that “limits democratic control over central elements of economic policy and regulation by locking in future governments to liberal frameworks of accumulation predicated on freedom of enterprise” (Gill 2002, p.47). The defeat of the *Moon Agreement* may not ‘lock’ future governments into adhering to pro-corporate trade agreements or neoliberal interpretations of the OST, as have the mandates of the Washington Consensus and domestic legal interpretations like the *Citizens United* case. Yet it prevented a mineral commonwealth for celestial bodies from taking root in international political institutions and opened the door for the CSLCA.

Might we see neoliberal constitutionalism take root in space resources law in a more concrete or codified way? Schneidermann (2013) has demonstrated that neoliberal constitutionalism is being globalised in the form of a new investment rules regime, realised most nefariously in investor-state dispute settlement (ISDS) provisions being incorporated into international trade agreements. ISDS clauses allow foreign corporations to seek damages from governments that have introduced policies that may affect their expected profits (an anticipatory claim to damages beyond real private property). These cases are often tried in largely unaccountable and undemocratic international arbitration courts. One example of mineral sovereignty being protected through ISDS litigation is the *Lone Pine Resources v. Government of Canada* suit, in which an American oil and gas company has sought US \$119 million in damages following Quebec’s moratorium on fracking and the revocation of Lone Pine’s exploration license (*Lone Pine Resources Inc. v. Government of Canada*). ISDS clauses thus become part of a supranational “supraconstitution that can supersede domestic constitutional norms” (2014, p.3).

We can only speculate about whether anything similar to ISDS multilateralism will enter the space law and policy field in the future. However, there is some evidence that NewSpace actors and Atlas neoliberals are exploring the possibility of multilateral resource appropriation agreements outside of the terms of OST or the fora of the United Nations – as articulated in a recent report from the Reason Foundation, for example (Greason & Bennett 2019, p.vii, p.76). In drawing this discussion to a close, let us consider that the OST preamble states a desire of State parties to “contribute to broad international *cooperation* in the scientific as well as the legal aspects of the exploration and use of outer space” (OST 1967, my emphasis). Space miners and their legal teams appear conscious of the problem of unilateral declarations of rights to private property ownership in the global commons. Some

have made optimistic assertions that:

“The birth and passage of the first national space resource utilization legal regime is the first step toward further international cooperation in space and it will ultimately benefit all mankind. With similar legislation being drafted in other nations, bilateral and multilateral agreements will develop between like-minded nations that see the economic, environmental, and social importance that space resource utilization will bring to their respective countries.” (Kfir 2016).

‘Like-minded’ economically elite and technologically advanced nations could draft agreements governing the space commons, before most of the rest of the world gets a foot in the door. Hertzfeld, Weeden and Johnson appear to be supporting a ‘sidestepping’ of the OST and the UN, proposing a “system of arbitration” embedded in national laws, predicated on the assertion that “there is no compelling argument that all issues in such [extra-jurisdictional common] areas need to or can be resolved through one organisation or one agreement” (2016, p.25, p.24). Writers with the *Cato Journal* have also made the suggestion that space firms could even “choose the law they want to apply to their agreement in the event of dispute” by one day working through international arbitration courts (Salter & Leeson 2014, p.593).

“Perhaps commercial space pioneers would use already-existing arbitration associations, such as the [International Chamber of Commerce] ICC, in order to enforce celestial property rights. Or perhaps a body of private outer space law – informed at its core by familiar precedents relating to nuisance, damages, liability, and so on – might progress to the point that space-specific arbitration agencies, employing their own experts in space law, would serve as the primary dispute resolution mechanism and process by which precedent is set. Alternatively, the first space pioneers might have a voluntary convention in which their representatives form a kind of outer space ‘social contract’, thereby setting the rules for original appropriation of unowned resources, property rights enforcement, and the proper bounds of behavior between parties when one party’s behavior imposes uncompensated burdens on others...” (ibid, p.593-594).

Multilateralism is no guarantee of benefits for all humankind – this much is clear in neoliberal globalisation and the legal innovations that support it.

4.3 Conclusion

Concerns about the future of the space commons are ostensibly defences of the rule of law, a familiar problem in the genealogy of jurisprudence and justice. Who decides the law? Who does it really benefit? How flexible should legal interpretation be? Space mining advocates simultaneously ascribe legality to the CSLCA and irrelevance to the OST, as part of a (US-centric) neoliberal constitution for outer space. Their interpretations of ‘freedom to use’ and ‘benefits to all mankind’ are weighted heavily toward corporate freedoms. The rule of law is predicated on the stability of laws (Raz 1979, ch.11), yet legal adjudication and interpretation often push the law “in novel and unexpected directions” (Bottomley & Bronitt 2012, p.50).

While correct in pointing to central ambiguities in its wording, defenders of domestic private property law for outer space are employing a mode of ‘constitutional’ interpretation of the OST that essentially ignore its fundamental tenets (non-appropriation and universal benefits, in particular). If legal precedent shapes subsequent behaviours, then the justification of domestic space private property within the *res communis* provisions of the OST effectively becomes a ‘constitutional argument’ to justify further consolidations of corporate rights to exploit the off-world commons. NewSpace-sympathetic writers with the Atlas Network’s TechFreedom think-tank have testified before Congress, strategising on precisely this goal:

“In the future, after the U.S. has shown its world leadership by establishing a domestic regulatory approach that encourages private sector advancement into space while protecting the core values of the OST, then the U.S. will be able to negotiate a future treaty from a position of strength, as by that time U.S. entrepreneurs will already have established themselves as the ‘first movers’ in a huge new economic arena...” (Dunstan & Szoka 2017, p.6).

To be the ‘first movers’ on a new frontier...What precedents do we have for the corporate appropriation of off-world mineral resources through unilateral private property law? In the next chapter, we will continue on the high seas, and explore the pre-modern history of the colonial frontier. Here, in the age of the pirate and the privateer, we can find precedents for powerful states granting powers of mineral sovereignty to their commercial vanguards, cloaked under the mythologised virtues of the colonisers.

5. Privateering the cosmic frontier: empire, myth and the violence of property⁹³

There is an intractable link between national sovereignty and private property (Chapter 2), particularly as manifest in mining rights (Chapter 3). A neoliberal constitution has emerged in international law that fortifies corporate rights to extract from and pollute the global commons, as Atlas organisations pressure sovereign states to undermine alternate legal orders that recognise collective rights and responsibilities. NewSpace’s ‘constitutional’ arguments attempt to create a legal justification for private off-world resource appropriation in advance of this speculative project being realised (Chapter 4). In this chapter, we will move further into the realm of the anticipatory, as I discuss how state-corporate appropriation on the cosmic frontier might transpire.

I will do this by counter-posing my own speculations against an episode in NewSpace myth-making, a tale of off-world privatisation. The now-defunct NewSpace start-up MirCorp had briefly privatised the Russian space station *Mir* – this was essentially NewSpace’s first and only corporate outpost in space. The story of MirCorp is told by NewSpace protagonists in the documentary film, *Orphans of Apollo* (2008). This text is arguably the zenith of the network’s anti-statist and anti-bureaucratic mythos: it is a paean to NewSpace entrepreneurialism that implicates NASA and the US Government in the failure of MirCorp, while simultaneously absolving speculative capital. The documentary invokes the figure of the pirate – the original extra-territorial anarcho-libertarian – and in doing so, it broaches the tension between national appropriation and private mineral ownership that is at the heart of this dissertation. I will use the *Orphans*’ pirate imagery as a heuristic for establishing precedents for space mining in the age of maritime colonialism (returning to themes I raised in section 3.2.1). I posit that the state-backed space mining firm bears closer resemblance to the privateers and charter companies of maritime colonialism: pirates for hire and commercial vanguards for empire, pushing back the frontier.

To describe a place or space as a frontier is to give it an ostensibly geographical designation: it can describe the furthest extent of a civilisation, the periphery at spatial remove from the core (Wallerstein 1974). It can also denote areas that are particularly

⁹³ Most of sections 5.1.1 and 5.2 were first published in an article in which I was sole author (Johnson, M. 2018, ‘Privateering on the cosmic frontier? Mining celestial bodies and the ‘NewSpace’ quest for private property in outer space’, in J.Arvanitakis and M.Fredriksson (eds.), *Property, Place and Piracy*, Routledge, Abingdon, pp.123-139). I have obtained permission from Dr Arvanitakis and Dr Fredriksson for using this material here.

difficult to access, like mountainous regions, jungles, deserts and outer space (Hall 2013, p.53). As Derek Hall notes in his political economy of land, “frontiers are areas where states fall well short of exercising administrative control” (2014, p.52). Yet using physical or political-geographic terms to describe frontiers is to neglect their cultural characteristics and their mythoi. The future studies scholar William Kramer (2014) reports on the ongoing use of frontier metaphors in NASA mission planning and lists the adjectives that can accompany frontier discourses and the role of the valorous pioneer within them. The frontier can be:

“unknown, vast, lonely, godless, godforsaken, virgin, barren, unbroken, untamed, heathen, wild, desolate, savage, unforgiving, cold, hostile, foreboding, limitless, dangerous, uncivilized and even angry. These, then, contribute to the suite of terms that describe aspects of pioneers’ relationship to that frontier, such as fear, battle, challenge, assault, conquering, conquest, subduing, civilizing, and taming” (Kramer 2014, p.181).

To varying extents, frontiers are anomic or lawless (*anomos*; discussed in section 2.3) – at least from the perspective of colonisers. Frontiers either lack a *nomos*, or there is an older, indigenous *nomos* that is displaced by a new colonial *nomos* through state-sanctioned violence (Walker 2013, pp.400-401). To tame, to conquer and to subdue – more than mere geophysical marker, ‘the frontier’ indelibly connotes the violence of colonialism.

‘The frontier’ has always been a central trope in NewSpace discourse, one in which discourses of individual freedom or deregulation merge with the inherent patriotism of the US-centred movement. The Tea Party in Space is one organisation that participates in the ‘March Storm’ or ‘August Blitz’ inter-organisational lobbying events held by the Alliance for Space Development (ASD 2019, p.1). In their policy platform, they state:

“Only through fiscally responsible policy, which limits government bureaucracy and stimulates the free market, will the United States expand on its leadership in space. By removing barriers of entry to the utilization of the solar system, new business models become viable. This sound free-market-based approach will create new sectors of the economy and strengthen America as the vanguard of freedom and opportunity as we spread throughout the solar system. We will carry forth the American values that made our nation great. The United States will settle space as it settled the American continent. The days of Lewis and Clark, and Apollo, are over. This is the Oregon Trail space policy” (Tea Party in Space 2014).

The Tea Party in Space’s platform invokes some historically durable motifs – not least of all the mythological figure of Apollo, namesake of the US’s lunar program. In addition to

neoliberal edicts of ‘fiscal responsibility’ and removing barriers to entry, the Tea Party in Space’s platform is, in their words, “grounded in American exceptionalism” (Tea Party in Space 2014).

This exceptionalism is expressed in spatio-historic terms through the invocation of the frontier. NewSpace will ‘carry forth the American values that made our nation great’ onto unsettled celestial bodies like the civilian pioneers westward bound on the Oregon Trail. NewSpace believes it will be the exceptional, valorous entrepreneur who is skyward bound as ‘the vanguard of freedom and opportunity’ – America’s destiny manifest in a union with free-market capitalism. Parker (2009, pp.89-90) has noted the synergy between the westward frontier and the libertarian space frontier. Henry David Thoreau (1817-1862) had said, “Eastward I go only by force; but westward I go free” – on the frontier, one could “forget the Old World and its institutions” that lay across the Atlantic, because “we go westward as into the future” (2008 [1862]; Parker 2009, p.89). For libertarian space advocates, beyond the atmosphere lies an open expanse of extraterritorial liberty, an endless frontier in which to exercise one’s inalienable right to private property ownership, untethered to terrestrial polity or regulation.

However, unacknowledged in the frontier romanticism of Thoreau and the Tea Party in Space is the fact that the Oregon Trail had been blazed, in large part, by the Hudson’s Bay Company (Douthit 1992). This British charter company was incorporated by King Charles II in 1670 for the purpose of “finding some Trade for Furs, Minerals, and other considerable Commodities...[from which] there may probably arise very great Advantage to Us and Our Kingdom” (*Royal Charter of the Hudson’s Bay Company*, HBC Heritage 2016). The Company was granted powers of de facto government, and had exercised the rights bestowed by the Crown “to send either Ships of War, Men or Ammunition...unto any their Plantations, Forts, Factories, or Places of Trade aforesaid, for the Security and Defence” of the land it had claimed along the fabled ‘pioneer’ trail from Missouri to Oregon (HBC Heritage 2016). Also missing from the above frontier mythologies is the fact that the American continent had been pioneered millennia before the arrival of early industrial civilisation. The indigenous societies that lived and worked the land prior to the Oregon Trail were often key sources of trade for Anglo-American wagon trains and, through disease and violence, were frequently killed through contact with white settlers. Far from forgetting the institutions of the Old World, “free from all worldly engagements” (Thoreau 2008), the frontier freedoms of white pioneers were enabled by European monarchical sovereignty – often expressed and solidified through

colonial violence.

Myth-making is abundant in NewSpace. By myth, I mean both a falsehood and a ‘legend’ that “still powerfully conveys some important moral and social lesson” regardless of its veracity (Christman 2014, p.3). The mythic frontier appears in the policy platforms of NewSpace organisations. It appears in the promotional material of prospective space miners: Moon Express, for example, looks to new colonial horizons and core-periphery relationships when asserting that “The Moon is Earth’s 8th continent, a new frontier for humanity with precious resources that can bring enormous benefits to life on Earth and our future in space” (n.d.). The frontier trope is also evident in the private property advocacy formulated and published by neoliberal think-tanks. In contrast with Thoreau’s wistful sauntering in the wilderness, for Edward Hudgins of the Cato Institute, the off-world frontier promises commercial infinitude and boundless capital accumulation, so long as it is tamed through private property rights.

“In the past patriots fought to establish political and economic conditions of free exchange and private property rights. These conditions opened commercial frontiers on Earth and allowed us to create material wealth and technical capacities never dreamed of. By establishing these conditions throughout the solar system, we will open boundless new commercial frontiers.” (Hudgins 2002, p.xxv)

Hudgins claims private property will open new frontiers, rather than enclose them or establish new barriers to open access. Much like the Tea Party in Space, Hudgins fuses together the heroic narrative of American nationalism with neoliberalism’s omniscient market and the trailblazing entrepreneur.

This chapter explores the ‘geo-mythography’ (Connery 2001; Dean 2006) of the frontier and its role in NewSpace’s political imaginary. I begin by discussing *Orphans of Apollo* and its invocation of the pirate, and move into a discussion of the privateer – an alternate figure in maritime colonialism that brings us closer to a precedent for the state-backed frontier mineral rights of the CSLCA.⁹⁴ To what extent would the NewSpace mining

⁹⁴ As a point of revision, space mining start-ups represent the contemporary, ‘business face’ of NewSpace’s utopianism. The business model for space mining currently appears geared towards more sober, feasible projects in the form of extracting water from asteroids, separating it into hydrogen and oxygen for fuel and selling it (through presently non-existent mechanisms for off-world trade) to national space agencies and their ‘big aerospace’ contractors. However, civil society organisations and several founders of the space mining firms within the broader NewSpace network consider *in situ* resource utilisation as the vehicle for the permanent settlement of other celestial bodies. From O’Neill and the L-5 Society through to SpaceX’s proposed Colonial Fleet (Musk 2017, p.49), NewSpace has consistently treated off-world resource

project mirror the frontier appropriations of the privateer and the joint-stock company? On the one hand, I venture that the legislative guarantee of private mineral rights represents the first, pre-emptive step in a neo-colonial entwinement of US resource imperialism and NewSpace's humanising mission. In the off-world, there is an unrealised, anticipatory violence lurking behind the promise of property ownership – such as the Trump Administration's 2019 establishment of a US Space Force that would (among other geostrategic priorities) protect American commercial interests in space (DoD 2018). On the other hand, NewSpace colonialism is discordant with the piratical and imperial violence that has plagued the frontiers of Earth. For NewSpace, the Solar System represents the guilt-free frontier – a benign colonialism. To use Hegel's words, it is an attempt to escape from the “slaughter bench” of history (2001 [n.d.], p.35).

5.1 Piratical NewSpace: parables of frontier libertarianism

I have discussed NewSpace's apparent desire to escape collective responsibility and its espousal of libertarian political philosophies at numerous places in this dissertation (e.g. O'Neill 1977; Henson 1980; Zubrin 1994; Tumlinson 2003; ASD 2019), as has also been discussed in sociological studies of NewSpace (Dickens & Ormrod 2007; Parker 2009; Valentine 2012; Genovese 2017; Shammass & Holen 2019). In the documentary film *Orphans of Apollo* (2008), NewSpace anti-statism is at its most virulent – particularly in the rhetoric of Walt Anderson, a 'proto-Musk' ICT billionaire who provided financial backing for the MirCorp start-up at the turn of the millennium. MirCorp's brief privatisation of the ailing space station *Mir* proved that raising the Jolly Roger flag on the off-world frontier was premature. Yet, as evidenced by Walt Anderson's conviction for tax evasion, we can nonetheless see NewSpace actors enjoying some piratical freedoms via the off-shore jurisdiction.

appropriation as the key to 'humanising' the cosmos (O'Neill 1977). I thus treat space mining and space colonisation, the visioner's contradictory impulses of technical pragmatism and utopianism (McCray 2013), as intractable elements in this chapter.

5.1.1 *MirCorp and the Orphans of Apollo*

For NewSpace and neoliberal actors in the 1990s, Russia's post-Soviet economic frontier held much promise. Following the dissolution of the Soviet Union under Mikhail Gorbachev (1985-1991), the Yeltsin Government (1991-1999) had enacted sweeping privatisation reforms that Naomi Klein (2007) describes as 'shock therapy'.⁹⁵ The 1993 constitutional crisis resembled the Pinochet Coup that preceded neoliberalism's Chilean laboratory (discussed in section 3.2.3, footnote 68). The Russian Parliament had resisted an increase in the executive powers of Yeltsin and was met with shelling from tanks positioned across the Moscow River. Yeltsin's subsequent voucher privatisations and 'loans for shares' scheme involved the sale of state assets to favoured individuals at heavily discounted prices – a process that left the country in the grip of financial crisis and famine, giving rise to the oligarchy and cronyism that persists to this day. Mischa Glenny describes the anomic character of the Russian economy at this point and draws comparison with the 'Chicago Boys' – albeit while neglecting the role of the 'Harvard Boys' in this shock therapy (Wedel 1998; see also Andrews 2014, p.110).⁹⁶

"The collapse of the Soviet Union is the single most important cause of the exponential growth in organised crime that we have seen around the world in the last two decades. Almost overnight, it provoked a chaotic scramble for riches and survival. From the bitter wars of the Caucasus to the lethal shoot-outs in towns and cities, this was a deadly environment as a new class of capitalist exploited the vacuum of power by seizing whole industries and raiding state coffers. Accompanied by an orgy of consumption and decadent behaviour, the like of which was last witnessed a century ago under Tsar Nicholas, it sucked every citizen into its vortex of violence [...] Russia's economy became a giant Petri-dish of Chicago-school market

⁹⁵ Gorbachev's glasnost and perestroika reform agendas had aimed for more gradual transition from communism to a mixed socialist economy, including reforms that gave work collectives and socialist cooperative greater managerial powers and permitted foreign trade, such as the *Law of the Union of Soviet Socialist Republics on state enterprises* (1987) and the *Law on Cooperatives* (1988). Under Yeltsin, the pace of privatisation increased rapidly.

⁹⁶ Journalist Janine Wedel (1998) recounts how, from 1991-97, Harvard economists Jeffrey Sachs and Lawrence Summers had guided Yelstin's Minister of Finance, Yegor Gaidar, in pursuing shock therapy by eliminating price controls and subsidies. Anatoly Chubais, who had overseen much of Yeltsin's privatisation agenda, had been entrusted by the Sachs-led Harvard Institute for International Development to receive substantial loans from the US and European Governments. Working for the US Treasury Department, Harvard's Sachs and Summers "used tens of millions in taxpayer dollars" to help Chubais "deform democracy and economic reform in Russia and helped create a fat-cat oligarchy run amok" (Wedel 1998). While I am unaware any participation of the 'Harvard Boys' in the privatisation of Russian space activity, US Government institutions clearly played a role in the broader currents of privatisation in which swept through Russian politics during this period.

economics, but among the cultures they were busy cultivating was a Frankenstein that slipped out through the door of their laboratory almost unnoticed. (Glenny, cited in Andrews 2014, p.109-110).

Amidst this economic turmoil, the Russian Space Agency and its newly decentralised administrative and mission control centres were operating under a limited budget. The Russian Government had already made financial, technological and diplomatic commitments to participate in the upcoming *International Space Station* (ISS). Under this fiscal pressure, the nation's publicly owned rocket manufacturing agency had been partially privatised as a state-owned corporation called RSC Energia. By the late 1990s, the Space Agency began pursuing new relationships with commercial actors, particularly those in the US. The Space Agency sold seats on *Soyuz* crew transport missions to a handful of wealthy tourists, while also launching private satellites. In 1999, Pizza Hut paid the Russian space agency \$1 million to print their logo on a Proton rocket (Parker 2009, p.88; see Kochetkov 2000). The image of hundreds of Muscovites queuing outside the city's first McDonald's restaurant is an enduring image of Russia's birthing into capitalism – to this, we can add a spacefaring fast food company as further evidence of US corporate penetration into the formerly communist state.

We can also see linkages between post-Soviet space privatisation and NewSpace actors within contemporary space mining. Planetary Resources co-founders Peter Diamandis and Eric Anderson were co-founders of Space Adventures, a space tourism company that from 1998 had found customers for these privatised Russian launch services. Their first repeat customer was Charles Simonyi, the billionaire and former Microsoft programmer, who flew to the ISS on 2007 and 2009 *Soyuz* flights. Simonyi was one of Planetary Resources' backers in its early funding rounds (CrunchBase 2019a).

Central to this tale is a team of early NewSpace entrepreneurs that had visited Russia in the late 1990s. They were given an armed escort as they met with government officials in Moscow, and one member remarked that it was “totally the Wild West” (Tumlinson, in *Orphans of Apollo* 2008). The group included Rick Tumlinson, founder of the SFF and co-founder of space mining firm Deep Space Industries, and the anarcho-capitalist Walt Anderson. Anderson was a telecommunications multi-millionaire and the venture's largest financial backer. He once confided to Russian space official Yuri Semenov: “I have to tell you about my utopia idea. We have to build a very big rocket and we allow all the bureaucrats in the world a free trip to space [in] one direction” (in *Orphans of Apollo* 2008). Like the frontier pioneers, the NewSpace team could sense opportunity.

Their goal was to privately operate space station *Mir*. From 1986-2001, *Mir* was a site of scientific research and experimentation, and was capable of housing 3 people at once (a fact which highlights how far NewSpace must go to realise the O'Neillian mass migration dream). While the US had the Apollo Program and the first manned lunar landing, *Mir* was the pride of the Soviet bloc. Towards the end of its lifespan, Russia began plans to de-orbit the space station. The posse of entrepreneurs had an alternative plan: if they could somehow privatise *Mir*, it could remain in orbit and become the first privately-operated space station. Leasing the ailing station from the Russian government would allow *Mir* to remain in orbit with reduced budgetary burden on constrained Russian coffers. The word '*mir*' means 'peace'; it was also the name used colloquially by Russian serfs for democratic fora that governed the collective distribution of land (Linklater 2015, p.142). There is thus some irony that '*mir*' was the namesake of NewSpace's first corporate outpost on the space frontier.

MirCorp was incorporated to undertake this privatisation, but it would only be a fleeting realisation of the NewSpace dream. In 1999, an agreement was reached between the NewSpace group and RSC Energia, the partially state-owned corporation overseeing *Mir*'s operation. MirCorp was incorporated as a partnership between the two parties: Energia owned 60% of MirCorp and oversaw technical management of the orbital station itself, while the American investors would own 40% and manage the business operations (Hudgins 2002, p.xix). The corporation would lease the station from the Russian space agency, by then renamed Roscosmos. The business plan included: flying-in wealthy space tourists; contracting *Mir* as a laboratory space; testing zero-gravity manufacturing projects; filming a reality TV program; and the space station becoming a staging post for deep space mining projects (Chambers & Gardellini, cited in *Orphans of Apollo* 2008). In April 2000, MirCorp launched its one and only mission, paying for Russian cosmonauts to complete repair work on *Mir* and boosting it to a higher orbit. But this was as far MirCorp would go: in December 2000, Roscosmos had finally decided to de-orbit *Mir* and, in March 2001, it broke-up in the atmosphere and the wreckage sank to the depths of the Pacific Ocean.

NewSpace actors have narrativized the decision to de-orbit *Mir* in a manner consistent with the aversion to bureaucracy and emphasis on individual liberty and economic freedom that pervades their political imaginary. Protagonists on the American side of MirCorp have claimed that NASA and the US State Department pressured Roscosmos to drop this new venture in favour of meeting Russian commitments to the ISS (Tumlinson & Chambers, cited in *Orphans of Apollo* 2008). They also allege that the export license for an American-made

‘tether’ technology, which they believed would keep *Mir* in orbit more cost effectively, was deliberately delayed by the State Department until after the de-orbiting decision had been made. The *Orphans of Apollo* documentary filmmakers offer a modest \$1000 reward for anyone who can find definitive proof of US Government interference in MirCorp’s project (*Smoking Gun Memo \$1000 Reward*, n.d.). All of which fits in neatly with the NewSpace narrative of government being the root cause for the demise of the space dream.

The exploits of MirCorp are recounted in the documentary film *Orphans of Apollo* (2008). The film tells the MirCorp story in a sympathetic light. The title harkens back to the era of Gerard O’Neill, the post-Apollo funding cutbacks and the disappointments of the Space Shuttle. Jeffrey Manber, MirCorp’s legal officer who was instrumental in drafting the *Mir* leasing agreement, describes post-Apollo spacefaring as “decades of dreams never realised, decades of false expectations, decades of government interference in what the private sector does best: opening up a new frontier” (Manber, in Villaneda 2009). Manber ignores the role of government in opening the space frontier, here offering a revisionist history of the American space program.

The film and its promotional material elucidate the NewSpace-neoliberal aporia that I have discussed throughout this dissertation (Free Radical Productions 2008). The film’s advertising features a trio of symbols with conflicting ideas about the state – piracy, communism and anarchism – and the tagline, ‘A rebel alliance of entrepreneurs dared to open up the final space frontier’ (Free Radical Productions 2008). In this evocative image, the contradictory impulses of NewSpace and neoliberalism are clear: the anarchists circled ‘A’ rejecting authority, the pirate flag as symbol of freedom and violent appropriation, unbounded by legal regimes; and the national flag as symbol of the state power in which property rights are grounded and where the colossal expense of space infrastructure generally accrues.

Against what authority does this ‘rebel alliance’ brandish the flag of the pirate? While Disney-fied and infantilised since, the pirate flag was originally a symbol of opposition to the empires of the pre-modern era. The libertarian ‘Orphans’ use the pirate flag here to conflate NASA and the State Department with a similar level of oppression. Michael Potter, the film’s director, would later surmise that: “The real drama was that the U.S. didn’t want these entrepreneurs, these anarchists to buy the Russian space station, because they wanted to have the monopoly on everything in space” (cited in Villaneda, 2009). This ‘US monopoly on space’ would, presumably, be NASA. In the wake of the space station’s demise, MirCorp’s

supporters have blamed public sector inefficiencies and spouted free market triumphalism. According to Hudgins:

“MirCorp struggled heroically to convert a money losing relic into a private, moneymaking success. Its tragic failure was due in part to NASA officials who seemed more comfortable with a Soviet space model than a free market one” (Hudgins, 2002, p. xx).

NASA’s alleged interventionism in *Mir*’s fate and the size of its bureaucracy now, supposedly, makes it a bastion of collectivism and redistribution, an undefined ‘Soviet space model’ that dared to hinder the invisible hand of economic liberalism. This is a curious assessment of NASA, given its centrality in the Cold War and its ongoing support of the privately-owned firms of the US military-industrial complex.

Beyond the protagonists' allegations of government intervention, this allusion to the pirate myth reveals the contradiction at the heart of NewSpace: the state is often portrayed as the enemy of freedom (to explore, to conquer and to trade) and yet so much of the NewSpace strategy relies on the participation of said state, one way or another. Hudgins' quip regarding the ‘heroic struggle’ of the free market (2002, p.xx) conveniently underplays the presence of RSC Energia, the former Soviet rocket manufacturer turned state-owned corporation, as a majority participant in MirCorp. This vision of free-market homesteading rested upon ailing ‘big science’ infrastructure built by the polar opposite of the free market, the Soviet Union, and was still owned by the Russian state. MirCorp supporters downplay the governmental origins and composition of Energia. Muncy, Tumlinson & Werb note that it was only a “partially publicly held firm” (2002, p.217), while Hudgins states that it was “over two-thirds privately owned” (2002, p. xix). These caveats might assist NewSpace in its mythologising of the heroic entrepreneur, the virtues of private property and the tyranny of regulatory oversight.

An alternate reading of the MirCorp case study would be to point to the US entrepreneurs’ inability to be credible capitalists. For NewSpace, this is obviously a more rhetorically and ideologically inconsistent proposition than a narrative of government failure. Roscosmos’s space budget was split between *Mir* and the soon-to-be launched ISS; NASA officials were concerned that Russian rocket manufacturing would not support both the ISS and a new phase of *Mir* occupation (Harland, 2005, p.281; *Orphans of Apollo* 2008). Failures in key systems and a series of accidents a number of years prior had also increased the technological challenges facing MirCorp. When the company missed a payment in December

2000 – shortly after it had announced an initial public share offering for the following year – Mir’s fate was sealed (Harland, 2005, p.283; Hall & Shayler 2003, p.363). In the Orphans’ anarchic narrative, less convenient targets are given less attention – chief financial backer Walt Anderson in particular. MirCorp’s inability to meet financial obligations to Roscosmos owe much to the dot-com crash of 2000 and a substantial loss in Anderson’s personal fortune – implicating speculative capital in MirCorp’s demise more so than the meddling of government agencies.

5.1.2 Tax evasion and the off-shore

Anderson was an interesting figure in the NewSpace network. He had been an early supporter of the SFF, with Peter Diamandis and Bob Richards (founders of space miners Planetary Resources and Moon Express, respectively) was a backer of the International Space University and had advocated for investment in monitoring asteroids for planetary defence (Hilzenrath, Leonnig & Noguchi 2005; The Space Show 2017). According to MirCorp CEO David Chambers:

“Walt’s view of the government, of state control, is completely resonant with that of people in what’s known as the NewSpace movement. That is, the loose agglomeration of anarcho-libertarian utopians who would like to get away from what they see as the intractable mess down here” (in *Orphans of Apollo* 2008).

For Anderson, escaping that ‘intractable mess’ involved a more immediate goal. In 2006, Anderson pleaded guilty to offshoring around US \$365 million in income between 1995-1999 in an attempt to avoid approximately \$200 million in personal income tax – at the time, it was America’s largest tax evasion case (Hilzenrath 2005). As part of a plea bargain to limit jail time, he admitted to “using aliases, shell companies, offshore tax havens, secret accounts and drop boxes” in the Netherlands, Panama and British Virgin Islands (Weiss 2006). One holding company was named ‘Gold & Appel Transfer’ – a reference to the ‘golden apple’ motif in the *Illuminatus!* libertarian sci-fi conspiracy novels (Weil 2000).

The *Orphans* invocation of piracy is telling, as it conjures notions of extra-territoriality and the ‘off-shore’ – a place to escape. The off-shore, in the contemporary political-economic sense, of course refers to foreign jurisdictions that help wealthy elites escape societal obligations in the form of taxation. Hudson posits ‘offshore-ness’ as a

fundamental component of the international economic order, where “jurisdictions beyond the regulatory reach of onshore regulatory authorities” play an important role in “the changing relationship between the geographies of globalization and sovereignty” (2000, p.269). The emergence of Luxembourg as only the second nation to introduce private property law in space is significant in this sense. Luxembourg has been described as “the tax haven of tax havens, present at all stages of the financial industry” (Zucman, cited in Abrahamian 2017). As discussed in chapter 1, Luxembourg’s *SpaceResources.lu* initiative has culminated in the *Space Resources Act* and a fund for investment in space mining start-ups (Luxembourg Space Agency 2019). Planetary Resources, Deep Space Industries and Japanese space miners iSpace have all established offices in the tiny constitutional monarchy (Table 1, p.74). It would appear contemporary NewSpace is perpetuating the ‘tax aversion’ established by Anderson, though not to the degree of tax evasion Anderson was charged with. Anderson has claimed that the money was being stored in low-tax jurisdictions before being given away as part of a large philanthropic fund, in which space exploration was but one component (Hilzenrath, Leonnig & Noguchi 2005). If this can be taken at face value, Anderson also serves as an example of how NewSpace actors have attempted to reach lofty, humanistic ends through contradictory, self-defeating means.

Moving past the Anderson case study, the oceans – the literal offshore – also have appeal for wealthy libertarians. MirCorp’s project of a self-contained haven for tech-savvy, monied elites has also been proposed for the aquatic frontier. Zalik notes that the “marine zone offers space freer from public disruption and constant forms of social accountability than on land” (2015 p.173). Indeed, there are many similarities between the privatised space station and the nascent project of 'seasteading'. Seasteading involves the use of 'islands' as libertarian utopias that exist outside the sphere of government influence, ranging from retrofitted oil platforms and (hypothesised) purpose-built floating islands, to cruising vessels permanently at sea (much like the Church of Scientology’s Sea Org). Steinberg, Nyman and Caraccioli (2012) surmise the views of the San Francisco-based Seasteading Institute:

"...the seastead is promoted simultaneously as the apotheosis of and an antidote to globalization, an insular and uncorrupted city-state where capitalism can regain its originary energy and where the spirit of human entrepreneurship can flourish" (Steinberg, Nyman and Caraccioli 2012, p.1533).

Peter Thiel – venture capitalist, Atlas supporter and financial backer of Planetary Resources and Moon Express – forms an interesting link between seasteading and 'spacesteading'. Thiel was an active supporter of the Atlas Network's Seasteading Institute, which is headed by Patri Friedman (grandson of the Mont Pèlerin Society founder, Milton Friedman). Friedman has spoken of 'start-up countries': independent city-states founded beyond national borders with no territorial allegiance (Friedman 2018). As with Walt Anderson's vitriolic mistrust of NASA and the US Government, seasteading appears to attract rich individuals with a resentment for the state's capacity to enforce tax obligations and impose other regulatory constraints.

5.2 Anomie on the frontier and (neo)colonial violence

“We were the privateers – it was all about being rebels” (MirCorp co-founder Rick Tumlinson, cited in *Orphans of Apollo* 2008).

Charged with stealing the wealth of the American people and hoarding it in tropical hideaways, MirCorp's Walt Anderson essentially gave the *Orphans* tale its own pirate of the Caribbean. Yet the *Orphans*' rebellion is arguably closer to Disney's Jack Sparrow than to 'Calico Jack' Rackham (1682-1720), the infamous English pirate who was hung for his crimes in Port Royal, Jamaica. MirCorp's Rick Tumlinson notes that the invocation of piracy in the MirCorp story was tongue-in-cheek fun – a Jolly Roger flag was even sent with the two cosmonauts to *Mir* (in *Orphans of Apollo* 2008). The pirate's capacity for unrestricted violence in plundering treasure from rival vessels undoubtedly highlights the limits of a direct analogy between the aquatic anarcho-libertarians of yesteryear and those of spacefaring, techno-utopian futures.

Nonetheless, the pirate remains a useful heuristic for approaching legal geographic questions of the frontier. Supporters of space mining have looked for precedents that portray the anticipated appropriation of frontier resources as peaceable, legal and harmonious. Writing in *Cato's Space – The Free Market Frontier*, space lawyer James E. Dunstan (2002) refers to the 842 pounds of lunar material collected by the Apollo missions. Dunstan argues that “customary international law precedent has been established for the proposition that

ownership can be exercised and claimed over pieces of celestial bodies” (2002, p.228).⁹⁷ NASA claims ‘ownership’ of these Moon rocks, uses them for public display, experimentation and inter-governmental loan, having exchanged some of these samples for samples obtained by the Soviet Union during their *Luna* robotic missions. Perhaps the Moon rocks do establish a precedent that things can be ‘owned’ in space – albeit in their original state, with no destructive extraction method or for non-profit, scientific purposes (Tronchetti 2015, p.8). However, as Fabio Tronchetti has noted, “it is simply not true that there is practice in the exploration and utilization of extraterrestrial resources, at least not in the form and content envisioned by the [CSLCA] 2015, p.8).

In this section, I will argue that alternate precedents can be found much earlier than the ‘old space’ period. The age of maritime colonialism tells us much about both the mythology and legal geography of frontier spaces and frontier resources, and how they are often ‘tamed’ through a union of national and private appropriation. It is instead the colonial privateer and the charter company that offer more realistic historical precedents for the state-backed appropriation of space minerals.

5.2.1 *From pirate to privateer: appropriation at arm’s length*

‘Beyond the equator there are no sins’ – 17th century maxim (in Policante 2015, p.53)

The pirate, as frontier libertarian of the colonial seas, was both anathema to and fundamentally constitutive of the international legal order that began to emerge alongside the “juridification of the oceanic commons” (Policante 2015, p.xii). The pirate of the pre-modern world was a violent appropriator exploiting the ‘free’ spaces outside the sphere of state power. From oceans of ancient Rome to modern Somalia, the pirate has held the status of *hostis humani generis* – the enemy of all humanity, an unlawful combatant akin to the terrorist. Paradoxically, efforts to eradicate piracy solidified the role of European colonial powers as protectors of the oceanic commons and global commerce, simultaneously strengthening the state’s monopoly on legitimate violence on the frontier (Policante 2015, p.xii; Heller-Roazen 2009). The political theorist Amedeo Policante notes that these “exceptional spaces navigated by the lawless freebooter and anarchic buccaneer progressively

⁹⁷ Dunstan now works with TechFreedom, a techno-neoliberal think-tank in the Atlas Network (e.g. TechFreedom 2015).

[disappeared]" alongside the death throes of the 'Golden Age of Piracy' (1650s-1720s) and the emergence of an international legal order that protected the oceans as a space for commerce (Policante 2015, p.73).

This juridification of the seas often involved pirates being employed directly by colonial powers through the arms-length institutions of privateering and charter companies. This represented a commingling between piratical lawlessness and the extension of state power, an imposition of a colonial *nomos* on the anomic frontier. To achieve this, a transformation in the pirate's legal standing occurred between the 16th and 18th centuries. During the European Wars of Religion, a 'state of exception' (Agamben 2005) became solidified in customary law and treaty agreements beginning with the *1559 Treaty of Cateau-Cambrésis*. 'Amity lines' were drawn to separate the emergent 'law of nations' between continental powers and an anomic space 'beyond the line', where "treaties, peace and friendship applied only to Europe, to the Old World, to the area on this side of the line" (Schmitt 2003, p.92). The amity lines ran east-west along the Equator or Tropic of Cancer to the south and a line of longitude running north to south near the Azores Islands, off the African coastline (ibid, p.90). To the other side was an anomic 'space of exception' exploited by the pirate, buccaneer and privateer.

It is within this anomic space beyond the inter-state order of continental Europe where the pirate became employed by the state: those who held a *lettres des marque et de représailles* (letter of marque and reprisal) were authorised to plunder enemy vessels and treasure without any limit on hostility. The pirate was transformed from lawless freebooter to state-sanctioned privateer: resources appropriated beyond the line were shared between privateers and state coffers, and the privateer became fundamental to European state-building (Policante 2015, pp.61-67). For example, Walter Raleigh's charter for Virginia reserved one-fifth of any 'royal metals' for the Crown (Lewin 1931, p.245). Raleigh and Francis Drake, two cherished figures in English history, were both privateers – heroes to one nation, pirates to another.

Royal charters were also given to privateers and joint-stock companies for the extraction of mineral resources and the claiming of territory. In addition to the examples I discussed in the history of mineral sovereignty (section 3.2.1), James I (1566-1625) authorised the *First Charter of Virginia* (1606) and reserved one-fifth of all gold and silver and one-fifteenth of all copper mined "within any Part" of the colonies for the Crown, alongside provisions granting local governors the authority to "cause to be made a Coin"

(cited in Thorpe 1909, p.3786). In the *Charter of Maryland* (1632), Baron Baltimore was granted fairly expansive provisions to:

“all Veins, Mines, and Quarries, as well opened as hidden, already found, or that shall be found within the Region, Islands, or Limits aforesaid, of Gold, Silver, Gems, and precious Stones, and any other whatsoever, whether they be of Stones, or Metals, or of any other Thing, or Matter whatsoever” (cited in Thorpe 1909, p.1678).

One-fifth of all these precious metals were to be delivered to Windsor Castle (Charter of Maryland, cited in Thorpe 1909, p.1679).

Charter companies were the commercial vanguards of Empire and were granted monopolies over foreign (and domestic) sources of resource wealth. While Pacific territorial claims in the late 18th and early 19th centuries involved direct annexation of territory for Britain, the territories and resources of the Americas, Caribbean, Central Asia and Africa were all claimed under the arms-length entity of the charter company. Key charters included: the East India Company (1600), Virginia Company (1606), Somers Isles Company (Bermuda; 1615), Royal Africa Company (1660), Hudson Bay Company (1670) and through to the Royal Niger Company (1886), which merged with the Oil Rivers Protectorate in modern day Nigeria in 1900. That the Sun never set on the British Empire at the turn of the 20th century is testament to the role of chartered, joint-stock companies – the first corporations – in ensuring England’s imperial competitiveness: “it may be said that in England, ‘monopoly’ formed the connecting link between ‘mercantilism’ and ‘protection’” (Hyde Price 1906, p.vii). The charter companies de-commoned the lands of the ‘new’ world, spreading capitalism by appropriating the lands and resources of indigenous populations.

5.2.2 Extending state power onto the cosmic frontier

What parallels can be drawn between the frontiers of the pre-modern seas and those of a possible spacefaring future? Might the frontier beyond the atmosphere comprise a similar state of exception, where the physical distance from the ‘concrete order’ (Schmitt 2003, p.65) of terrestrial legal and political norms results in an extra-legal or anomic space, free for plunder? While outer space cannot be considered ‘lawless’ (IISL 2016; Freeland 2017), the breadth of interpretations of the OST would suggest that the pre-emptive juridification of outer space retains an anomic character – existing ‘beyond the line’.

Schmitt's philological work identifies that the word 'pirate' is derived from "the Greek *peiran*, meaning to test, to try, to risk" (2003, p.43) – a contemporary definition of 'entrepreneur' might use similar terms. Indeed, Roth describes tech start-ups like Spotify and the Pirate Bay as "pirate organisations" (2014, p.402). NewSpace's aspirations to 'disrupt' the American space industries might have loose resonance with these cases in "economic terrorism" (Roth 2014, p.401). Yet we must return to *nomos*, and the intractable connection between acts of appropriation and the establishment of law (Schmitt 2003). While the CLSCA would not entail the American flag being planted on the surface of an asteroid or celestial bodies, the US is tacitly claiming some level of jurisdiction via acts of corporate appropriation. Acts of piracy involving intellectual property may represent "a revolutionary act to confront property rights that ruptures the neoliberal ideology" (Arvanitakis & Fredriksson, 2016, p.140). Yet the 'piratical' NewSpace are clearly extending and reliant upon state power rather than challenging it, brought within the empire as if given a letter of marque. While many NewSpace actors may see off-world, private property-based colonisation as an act of protecting the future of the human race, the CSLCA has also been interpreted as an act of plunder (e.g. Oduntan 2015).

As a unilateral guarantee of private mining rights, the CSLCA effectively positions the US in opposition to other nations – spacefaring or otherwise – seeming to contradict the *res communis* nature of the OST. The United States would recognise and enforce its citizens' resource claims on the space frontier in the name of "[developing] in the United States...economically viable, safe and stable' space resource industries" (CSLCA 2015, s.51302). This exploitation of the frontier as a 'state of exception' is an act of economic competition, and the CSLCA bears some resemblance to the royal charter or the letter of marque – minus the licensing of armed plunder of rival vessels. Resources claimed in outer space will generate tax revenue and further political prerogatives of economic growth (jobs, infrastructure and so on), akin to the role of privateering and joint-stock companies in European state-building. The space mining firm becomes the commercial vanguard, enabling an indirect form of 'accumulation by dispossession' (Harvey, 2004; Dickens & Ormrod, 2007) – a piratical act of pre-emptively stealing resources owned by all.

As we discussed in the previous chapter, NewSpace lawyers have made legal argumentation that resemble the 'acquiring empire by law' justifications of pre-modern jurists like Grotius (Benton & Straumann 2010). In seeking precedents that show how private property law could be commensurate with the OST, one supporter of space mining has

pointed to an intriguing case study in the history of charter companies – one which inadvertently weakens the case that national appropriation could be demarcated from private mineral appropriation. Appearing in Cato’s *Space – The Free Market Frontier*, space lawyer Wayne White admits that “traditional real property rights are inconsistent” with Anglo-American constitutional law which “dictates that [a] government must have sovereignty over territory before it can confer title on its citizens” (White 2002, p.84). Elsewhere, White has proposed that a solution to the sovereignty problem is for terrestrial governments to confer ‘functional’ – as opposed to real – property rights, whereby the owner is granted use of an area without the right of exclusion that would accompany real property rights.

“Functional property rights permit free access to all areas of outer space and celestial bodies because they do not necessitate territorial sovereignty and its consequent appropriation of large areas of space... The regime is attractive because it is so easy to implement. Nations can unilaterally enact legislation, and they can tailor that legislation to conform to their existing property laws” (White 1998).

He provides few examples to support this proposal, acknowledging that “terrestrial governments have never actually conferred or recognized property rights predicated on functional rather than territorial sovereignty” (White 1998).

White employs the case of the (once) unclaimed Spitsbergen Island off Norway’s coast, in which the establishment of coal mining and whaling operations briefly involved a functional sovereignty arrangement between a handful of nations. In 1613, the chartered Muscovy Company had claimed the island for England after commencing whaling operations. The Denmark-Norway union empire had also claimed it in 1616. Russia had begun coal mining in the late 19th century. Uninhabited Spitsbergen was effectively treated as *terra nullius*. As the US Secretary of State proposed as a negotiator for the 1920 Svalbard Treaty, the region could involve ‘political sovereignty’ (sovereignty over settler whalers and miners) rather than territorial sovereignty over the island itself. For White, Spitsbergen implies that it is possible to for states to grant functional rather than territorial property rights outside of their jurisdiction, and therefore, there would be some precedent for states granting private property rights on celestial bodies in a manner consistent with the *Outer Space Treaty*.

However, the advent of World War I ended the prospects of negotiation. In 1920, the *Treaty* was signed granting:

“...sovereign power over Spitsbergen to Norway while guaranteeing rights of commerce and fishing to all interested parties. It thus ended the state of anarchy while permitting the continuation of existing mining interests” (Fitzmaurice 2014, p.315).

A counterpoint to White’s argument is provided by Pop (2000; pp.277-279). Discussing both Spitsbergen and Jan Mayen Island, Pop demonstrates that in areas of ‘non-sovereign resource exploitation’ “eventually a State sovereignty was superimposed over the private appropriation of the real estate” (p.278). This suggests a precedent that the granting of mineral rights eventually leads to more formal territorial sovereignty. The establishment of a political community of whalers and miners was important in this: whether something similar happened in outer space might be contingent on whether off-world mining took place through robotics or through human habitation. In any case, the establishment of mining interests had occurred under inter-state recognition of *terra nullius* rather than *res communis* provisions like those established under the OST.

The Spitsbergen scenario – where the flag follows the mine – is but one historical case study that illustrates how sovereignty can devolve from private mineral rights on the frontier. Given the colossal expense of space mining, it is more likely that it will be conducted by the behemoths of the US military-industrial complex than small Silicon Valley style start-ups (perhaps Lockheed-Martin’s government contracting will help them afford space mining operations). In this case, the comparison with the charter companies of maritime colonialism would be more overt. Alternatively, we could look to case studies in ‘free mining’, such as the Californian gold panners who briefly formed semi-autonomous political communities in the 19th century. Yet – if we return to the *Orphans* yearning for more immediate pirate utopias – the fundamental reliance on the state’s legislative apparatus underscores the implausibility of having a truly stateless space utopia. As privateers and patriots, “[extending] our free-market values into space” (Kerner, cited in Space Frontier Foundation 2015), NewSpace mining firms would effectively extend state influence ‘beyond the line’ under the guise of entrepreneurial commerce. It serves as a further reminder that, far from being anarchistic or libertarian, the NewSpace philosophy is distinctly neoliberal. Rather than achieving statelessness on the frontier, the state is in fact fundamental for safeguarding the operation of a market for space resources. The act of authorising private property rights in space constitutes a *de facto* national claim on those resources.

5.3 The benign colonialism?

This comparison between maritime colonialism and space mining is valuable on a politico-legal level, yet it involves some obvious points of contrast. The military technoscience of spacefaring powers is yet to be deployed as a means of supporting resource appropriation or the protection of private property on celestial bodies. Several space lawyers have spoken optimistically, noting the possibility that space will continue to be used predominantly for peaceful uses and that multilateral consensus will prevail as space mining inches closer to reality – there is “good hope for the eventual prevalence of international law to govern space resource activities” (Masson-Zwaan & Palkovitz 2016, p.5; see also Freeland 2019, p.8). However, if we are to look to historical precedent in envisioning how off-world mining might transpire under the terms of CSLCA, we cannot ignore the possibility of violent, ‘primitive’ accumulation on the space frontier (Marx 2015 [1887]; Dickens & Ormrod 2007; Marshall & da Rimini 2018). Rather than recognise private property’s history of violence, however, the NewSpace narrative has a tendency towards historical deletions (Barthes 1973 [1957]; Messeri 2017). The political mythology of NewSpace self-ascribes benevolence to the colonisers, as part of a familiar ‘geo-myth’ that presents the frontier as a site of progress.

5.3.1 *The violence of property*

“Our destiny, beyond the Earth, is not only a matter of national identity, but a matter of national security...Establishing the Space Force is critical to preparing the Department of Defense for the evolving warfighting environments of the twenty-first century” (President Trump, in ‘Space Policy Directive 2019’).

When we speculate about violence in outer space – such as state-sanctioned violence that protects corporate property – we might be heading towards the terrain of science fiction. Yet, if the reader finds the prospect of an actual ‘Star Wars’ entirely implausible, it is worth remembering that the US Congress once allocated over US \$3 billion for the Reagan Administration’s plans to construct particle beam weapons in space (Gerstenzang 1986). The Strategic Defense Initiative was eventually cancelled, but outer space has of course featured in US military planning ever since the Cold War began. For further examples, we can consider that the US (in 1985) and China (in 2007) have demonstrated an ability to shoot

down satellites (so far deployed against their own space assets). In 2019, the Trump Administration established the US Space Force as a unique branch of the US Armed Services. Russia has maintained its own Space Forces in different guises since 1992. The US's rival space superpower might prove to be the People's Republic of China, which was recently successful in landing on the far side of the Moon. What role might violence play in the state-corporate enclosure of the off-world mineral commons?

The formation of liberal capitalist states was violent, particularly in processes of enclosure and colonialism. Karl Polanyi's narrative of early capitalism revealed that enclosures involved more than the legal, regulatory and administrative functions of the state. Following his fellow historical sociologists Weber (2008 [1919], p.127) and Marx (2015 [1887]), Polanyi had identified that the commodification of land was enforced, in large part, through "individual force or violence" and "war and conquest" (2001, p.189). Dominion over land and territory was predicated on conquering the common lands of indigenous populations, or subjugating underclasses within a sovereign territory. There was a nexus between what Weber described as the state's monopoly on 'legitimate' violence (2008, p.127) and the interests of economic elites. George Orwell described the violence of enclosure on English soil:

"...the landgrabbers did not even have the excuse of being foreign conquerors; they were quite frankly taking the heritage of their own countrymen, upon no sort of pretext except that they had the power to do so" (n.d. [1944]).

Private property in land is inherently violent. In Marshall and da Rimini's words, "Without violence and its threat, property borders are vague" (2018, p.51).

Enclosure involved commoners being forcefully evicted or killed in what Marx described as 'primitive accumulation' – capitalism's "original sin" (2015, pp.507). For Marx, primitive accumulation was the "process that transforms, on the one hand, the social means of subsistence and of production into capital, on the other, the immediate producers into wage labourers" – "nothing else than the historical process of divorcing the producer from the means of production" (Marx 2015, p.508). Marx described how the global expansion of capitalism required the destruction and dislocation of indigenous societies, where the development of industrial capitalism in homeland metropolises was fuelled by primitive accumulation in the New World.

“The discovery of gold and silver in America, the extirpation, enslavement and entombment in mines of the aboriginal population, the beginning of the conquest and looting of the East Indies, the turning of Africa into a warren for the commercial hunting of black-skins, signalised the rosy dawn of the era of capitalist production. These idyllic proceedings are the chief momenta of primitive accumulation. On their heels treads the commercial war of the European nations, with the globe for a theatre” (Marx 2015, p.533).

While I have argued that the CLSCA represents a similar ‘primitive’ or primeval act of appropriation (Schmitt 2003), no social dislocation will result from the CSLCA. Dickens and Ormrod have aptly surmised that commodifying the off-world involves a pre-emptive form of primitive accumulation, “one not dispossessing anyone already using those resources” (2007, p.59).

Nonetheless, the CSLCA does raise the question of how space property rights would actually be claimed, protected and enforced in outer space. As preposterous as it may have sounded when President Trump announced his intention to establish a US Space Force, it is in keeping with American exceptionalism. Often in the interests of neoliberal hegemony, the “supposedly uniquely disinterested moral values of American diplomacy” have involved the US taking on the role “as the world’s police force” in the global commons (Ó Tuathail & Dalby 1994, p.10).⁹⁸ Department of Defense white papers declare that the Space Force would protect the nation’s “unfettered access to, and freedom to operate in space”, ensuring both national security and “economic prosperity” (DoD 2018, p.5). Policy recommendations from the most recent Heritage Foundation *Mandate for Leadership* volume might be the source of the Trump Administration’s interest in policing the off-world commons (Heritage Foundation 2016, p.27). Tronchetti and Liu note that the Trump Administration has “taken multiple actions aimed at consolidating US leadership in space” – this has included the prospect of further commercialisation of activities traditionally performed by NASA, and an apparent desire to place weapons in orbit (2018, p.429). The ‘lawful violence’ of the state – here, a pre-emptive projection of American might – is acting as “the steel lining to the velvet glove” of commerce (Polanyi 2001, p.14).

Much like the role of charter companies and privateers in furthering imperial causes,

⁹⁸ The creation of Space Force was a policy directive that was, at the time, inflected with Trumpian hyperbole and incoherence (see also Tronchetti & Liu 2018 on the uncertainty surrounding recent US space policy). Yet Congressman Ken Kramer (R-CO, 1972-87) had actually proposed a ‘US Aerospace Force’ as early as 1981 (Michaud 1986, p.217). Bromberg (1999) also notes that NASA’s status as a civilian agency was initially uncertain. Would the Apollo 11 astronauts have gone ‘in peace for all mankind’ if the Moon landings were conducted by a division of the US Air Force?

space mining could be used to advance national cosmo-strategic imperatives. US space resources law has frequently been justified to the American political establishment through appeals to ‘American leadership in space’ (e.g. Planetary Resources 2014; ASD 2016, p.6; Dunstan & Szoka 2017; Richards 2017). NewSpace businessman Robert Bigelow, who owns a company that is developing inflatable space habitats in partnership with NASA, warned of the threat of China’s space program when testifying before the US Congress (Bigelow 2017). China’s development of its own commercial space sector is “not disconnected from its own military” (as though the US military-industrial complex and ‘big aerospace’ involved an alternative arrangement) and the US Government needs to “consider the disruptive strategic role China will play” – particularly if it is “commercial [space policy] with Chinese characteristics” (Bigelow 2017, p.5). More than just waving the Stars and Stripes, Bigelow points to the military-strategic priorities of the US while drawing on American antipathy to communism. As per the Cold War, political-economic ideology and geostrategy may prove to be intractable elements on the space resources frontier.

If a violent space frontier did materialise, we can really only speculate on the form it would take. Military technologies for the space frontier are highly advanced (although many are likely classified). The Space Shuttle began conducting military missions as early as 1985: these are still classified but were likely conducted for signals intelligence and other military communications (Howell 2016). Violence could be projected onto the space frontier in forms yet-to-be realised. ‘Space Aggressor’ squadrons of the US Air Force presently train troops to prepare for emergent threats against US space assets (Walters 2017). The Air Force’s *X-37B* drone spacecraft recently broke the on-orbit endurance record (718 days) for largely classified purposes (Ray 2017). Irrespective of any ‘old’ and ‘new’ periodisation, the American military-industrial complex was not abandoned with the Cold War – it remains a key driver of contemporary space commercialisation. Among other examples, the *OSIRIS-REx* spacecraft that has recently arrived at the asteroid 101955 Bennu – it was constructed in partnership with arms and aerospace arms giant Lockheed Martin (which I discuss further in the Epilogue).

None of this is to suggest that space mining will inevitably progress on violent grounds. Mineral resources could be responsibly extracted from asteroids as part of the peaceful and cooperative uses of space envisioned under the OST. It is important, however, that we recognise that this is also a speculative position. Competing narratives of cosmopolitanism and exceptionalism have endured in the American space program ever since

President Kennedy’s famous 1962 speech launched the space race.⁹⁹ We can see this when space miners pitch the O’Neillian cornucopia to the US political establishment: they claim to want to respect international law and elevate the global standard of living, but “without constraining the rights and the benefits of the freedom of U.S. commercial enterprise” (Richards 2017, p.7). As I discussed in relation to the terms of the OST, one actor’s freedom can easily preclude another’s ability to exercise their own freedoms. We cannot assume that the exercise of US corporate freedoms in space would necessarily lead towards the peaceful, cooperative use of outer space.

The deployment of state-sanctioned force in the protection of corporate-owned space resources appears explicitly in recent, attempted legislation. The *American Space Commerce Free Enterprise Act of 2017* (ASCFE 2017) was passed by the House in April 2018 (though it progressed no further and its 2019 iteration did not progress to the Senate). This bill asserts that the “private exploration and use of outer space by nongovernmental entities will further the national security, foreign policy, and economic interests of the United States” (ASCFE 2017, s.2). It further connects the economic activity of corporate actors with the sovereign power of the US by stating that:

“The President shall ensure that United States entity exploration and use of outer space, including commercial activity and the exploitation of space resources, is secure from acts of foreign aggression and foreign harmful interference and is given due regard, and the President shall uphold the ownership rights of space objects of United States entities. Space objects certified under this chapter shall receive the full protection of the United States” (ASCFE 2017, s.80111).

Again, we can only speculate how the President ensures that an asteroid miner is ‘secure from acts of foreign aggression’, or indeed how or why a foreign power would act aggressively millions of kilometres away from Earth. Nonetheless, Planetary Resources and other space corporations have lobbied for the ASCFE (CRP 2019c). Through the ASCFE, space miners have seemingly requested that these protections extend to corporate property on “obtained space resources” (ASCFE 2017, ch.801, s.80111). A press release from Atlas think-tank TechFreedom offers the organisation’s support of the ASCFE (TechFreedom 2017). As an example of the ‘strong state, free economy’ aporia, TechFreedom have praised this legislation as a “light touch to space regulation” (TechFreedom 2017), despite it making the expansive

⁹⁹ Discussed in section 1.1.3.

authorisation that ‘the full protection’ of the United States be used to secure to space mining operations.

The novelty and expense of owning property on the high frontier obscure what, on Earth, is a truism: the state protects its citizens’ rights to private property with recourse to ‘legitimate’ violence. Internal jurisdictions are tasked by national governments with providing a police force to protect against trespass, theft and damage to private property, while national governments recruit and maintain defence forces that protect territorial sovereignty (and the right to defer policing powers within their jurisdictions). In domestic settings, it is clear that the extractive rights of mining multinationals are protected through the exercise or threat of ‘legitimate’ violence. Consider the 2016 Standing Rock protests, in which Sioux activists rejected the construction of the Dakota Access Pipeline through their traditional lands due to environmental concerns. This grassroots movement against the powers of mineral sovereignty was met with the deployment of a militarised police force, in which local police employed riot gear, armoured vehicles, rubber bullets and other sophisticated technologies of suppression (Patinkin 2006). The militarisation of police forces across North America presents a challenge to the fundamental liberal democratic right of dissent; here it was being used to safeguard appropriation rights of oil companies against indigenous and environmentalist claims. These events mirror the armed conflicts between the Sioux and the US military during the second half of the 19th century, when military forces were deployed to assist frontier gold miners (not to mention the private armies and navies employed by colonial charter companies).

National militaries are also deployed to protect or enable corporate extractivism in foreign jurisdictions and in the global commons. American military supremacy supported the profitability of US oil services and engineering companies in Iraq, such as Halliburton and Bechtel. China, meanwhile, has previously deployed warships to protect oil rigs in the disputed South China Sea. Perhaps the People’s Republic of China will introduce its own mining laws for the off-world – such an act would be symbolically supported by what are the world’s second largest armed forces.

American projections of state power into the oceanic commons could be traced to the end of US isolationism and its turn to ‘open imperialism’ (Schmitt, 2003, p.292), through US annexations following the 1898 Spanish-American War (Puerto Rico, Guam and the Philippines) – not coincidentally the same period in which expansion on the internal frontier was declared finished (US Census Bureau, 2012). Parallels could be drawn between the

intermingling of national prestige, technological spectacle and projections of state power inherent in both Roosevelt's Great White Fleet of 1907 and American rocket launches since the Mercury era (1958-1963).

In this light, the passage of the CSLCA is not as an isolated political triumph for the NewSpace network, but rather reflects a pattern of both unilateral and multilateral resource imperialisms that the US has undertaken since WW2.¹⁰⁰ There are no client governments to install in outer space, but the extractive rights of US space miners are pre-emptively guaranteed by the US state's military power as much as they are by US public law. The paradoxical nature of NewSpace's relationship with the US Government is further accentuated when it is entrepreneurs with libertarian tendencies that have prompted this anticipatory projection of state power and might onto the space frontier. The US state is asked to protect the libertarian business that pretends to attack it; the 'rebel alliance' of Han Solo-style entrepreneurs turn out to be part and parcel of the Empire.

5.3.2 'Geo-mythography' and the escape from the 'slaughter bench' of history

The trope of the frontier speaks to both violent appropriation and – as it appears in NewSpace discourse – redemption and freedom. Frontier mythology has a highly emotive resonance: it appeals to individual and collective psyches through the frontier's promise of liberation, salvation and re-birth. As Blouet notes, “states are clever in promoting ambitions in the cloak of emotional appeals” (1994, p.285). The European colonial powers claimed theirs was a ‘civilising mission’ (Said 1995), a valorous project of “bringing light, faith and trade to ‘the dark places’ of the earth” as they murdered and subordinated indigenous populations on the imperial horizon (Lindqvist 2002, p.12). Ever since the Apollo program, outer space has held an important place in the emotional fabric of American national culture. What mythic elements can we discern in NewSpace cosmopolitics? What stories is NewSpace telling to render its colonial project as commensurate with the ‘benefit of all mankind’?

Political mythologies are not opposed to political rationality – they permeate and are indissociable from them (Dean 2006). Political economist Mitchell Dean has illustrated that “mythic, poetic and symbolic elements” permeate spatial and cartographic notions of political

¹⁰⁰ Examples include the case studies in ‘mineral sovereignty’ and regime change mentioned in Chapter 3, such as in Chile and the Middle East.

order (2006, p.1). Deploying Connery's term 'geo-mythography' (2001), he describes the mythic foundations of Schmitt's conceptions of *nomos*. For instance, Schmitt begins *The nomos of the earth* by saying: "In mythical language, the earth became known as the mother of law..." (Schmitt 2003, p.42). Pagan concepts of the Earth Mother are evident in Schmitt's account, which also drew on his conservative Catholicism in noting the herdsman or shepherd in the etymological roots of *nomos* (ibid, p.339-340). Indeed, Schmitt focuses on the *nomos* of medieval Europe's *respublica Christiania*, an empire with Holy Rome at its centre acting as *katcheon* or 'restrainer' of the Antichrist (ibid, pp.58-62; Dean 2006). The contrasts that Schmitt makes between *terra firma* and *mare libre* arrive at a sort of telluric mythos, his genealogy of spatial law and order invoking the "consecrated sites" and "sacred orientations" of landed existence (Schmitt, in Dean 2006, p.10).

The NewSpace imaginary of course involves a break from the 'Earth Mother' – a point Ormrod has argued while drawing on Freudian psychoanalytics (2007, pp.266-7) – but geo-myths are nonetheless an important part of their public justifications for space colonisation. 'Manifest Destiny' is a geopolitical discourse that emerged from Enlightenment progress ideology and is evident in many phases of American history and in the NewSpace vision (Parker 2009). Beginning with the 19th century impulse to "conquer and civilize the 'empty continent'", it was the United States' destiny to continue expanding (Ó Tuathail 1994, p.159). Like *lebensraum*, which had been inspired by Friedrich Ratzel's visit to frontier America, manifest destiny was a means of justifying imperial expansionism. This geo-mythography was wedded to American exceptionalism: if expansionism was America's 'destiny', the violence of this expansionism was morally justifiable. The political geographer Gerard Ó Tuathail summarises Manifest Destiny with the following quote from founding father Thomas Paine: "The cause of America...is in great measure the cause of all mankind" (1994, p.159).

The idea that humanity needs space to expand on the off-world frontier is a technoutopian version of Manifest Destiny. In his essay 'Capitalists in Space' (2009), Parker has noted the parallels between off-world expansionism and westward frontiers in American culture. He draws attention to the US historian Frederick Jackson Turner (1893), who had argued that when the westward journey ended on the Pacific Coast and the American frontier was effectively closed, it "augured badly for the future of the USA. American character was defined by novelty, adaptation and growth, so without this imaginative geography of a frontier, there was a danger of atrophy" (Parker 2009, p.89). I am reminded here of Gerard

O'Neill's remark that a steady state economy would allegedly produce a constriction of innovation and creativity that would be "abhorrent" (in Kilgore 2003, p.159).

For NewSpace and neoliberalism, Property represents Progress. Yet the notion of private property as inherently virtuous rests upon unstable myths (Christman 2014). Like American exceptionalism, the valorisation of private property rights in the NewSpace and neoliberal imaginary requires erasing or simply forgetting the violence of enclosure and colonialism. Space writer and policy analyst Rand Simberg produced *Homesteading the Final Frontier* (2012) for the Atlas Network's Competitive Enterprise Institute. He asserts that:

"...under the view of the universe as a frontier full of potential, the resources that could be developed from it offer great opportunity for human flourishing. Centuries of history demonstrate that the best means of doing that is via the free exchange of goods and services, undergirded by legally enforceable private property rights" (Simberg 2012, p.4).

In Simberg's view, 'centuries of history' validate private property – and not common property – as the driver of human flourishing. With the ahistoricity characteristic of neoliberalism and neoclassical economics, Simberg sweeps aside centuries of appropriation, displacement and violence that followed in capitalism's imperial wake. The history of private property is tainted with discrimination, coercion and the heavy hand of empire – this is inconsistent with the truth claims of universal beneficence inherent in NewSpace private property advocacy (regardless of how violent or peaceful space colonisation ends up being).

In his *Mythologies* (1973), Roland Barthes looked to capitalist myths. His description of the 'privation of history' offers some insight into NewSpace's erasure of property's violent past. According to Barthes, the privation of history was a myth of estrangement that divorced objects from their history.

"Myth deprives the object of which it speaks of all History. In it, history evaporates. It is a kind of ideal servant: it prepares all things, brings them, lays them out, the master arrives, it silently disappears: all that is left for one to do is enjoy this beautiful object without wondering where it came from" (1973, p.165).

Severing an object from its history – this is clearly taking place in NewSpace's revisionist history of private property. Consider the following remark from Moon Express' Bob Richards:

"As a country built on the foundations of Earth's frontiers, the United States stands unique in all the world with the opportunity to focus the power of its entrepreneurial history and

enterprising vision to open up the space frontier, and in so doing, create a peaceful, prosperous and boundless future for all humanity” (Richards 2017, p.1).

The United States *was* actually built upon ‘foundations of the frontier’, but only because the expansion of Anglo-American sovereignty involved the imposition of European law upon the foundational *nomoi* of native American law. The (un)settling of the American frontier was ultimately not a ‘peaceful, prosperous and boundless’ process for all Americans. The privation of property history excises the violence, so that colonial power can be ascribed a measure of ‘innocence’ (Whyte 2018, p.237), “as if one can take the good parts of a metaphor, setting the unseemly ones aside” (Messeri 2017).

In NewSpace representations of property and discussions of space colonisation that appear in neoliberal advocacy (see also Singal 2018), the off-world frontier presents a zone of guilt-free appropriation, an opportunity to escape what Hegel described as the “slaughter-bench” of history (2001, p.35). Hegel’s *Philosophy of History* described how, in the name of progress, “the happiness of peoples, the wisdom of States, and the virtue of individuals have been victimized” (ibid, p.33). Hegel viewed the violence of western civilisation as ultimately worthwhile, if it meant the eventual realisation of Freedom – a teleological account of human history that NewSpace appears to share with Hegel, that “the History of the world is none other than the progress of the consciousness of Freedom” (2001, p.33).

For NewSpace libertarians, off-world property represents a paradoxical freedom *from* the empire that is enabled *by* the empire. In their heroic colonisation of the off-world, they are relieved from repressing resistant ‘commoners’, from negotiating over prior land rights and from managing the ecological impacts of resource exploitation – all that needs to be done is undermine international treaty law (e.g. Gump 2018). Escaping history, the NewSpace salvationist narrative renders unilateral private property law as commensurate with “the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes” (*Outer Space Treaty* 1967, preamble).

5.4 Conclusion

“Spain gained political stability toward the end of the 15th century. The new king and queen decided they could not cede the resources of New World to their rivals in Portugal and launched several expeditions to the New World. Portugal and Spain were followed by the English, French, Dutch, and Russians and the Age of Exploration was underway. These nations combined new technologies, access to resources, and political will to forge a completely different way of life on Earth. The utility and value of these resources was unprecedented in history... Amazing things happen when political will, technology, and resources converge” (Marquez, in Planetary Resources 2016b).

Peter Marquez, Planetary Resources’ Vice President of Global Engagement, celebrated colonialism and the frontier in congratulating Luxembourg in joining the US as imperial guarantors of off-world resource claims (in Planetary Resources 2016b). The exploitation of space resources is treated as a ‘benign colonialism’, a literal *terra nullius* frontier that lacks the negative outcomes of terrestrial resource exploitation. Valorising and mythologising private property serves to erase a complex and often violent inter-relationship between private property and national sovereignty. Just as the imperial projects of European powers were justified as being ‘civilising forces’ for the ‘barbaric’ New World, the supporters of space mining claim we are witnessing an “enterprising vision...for all humanity” (Richards 2017). Yet, in Marshall and da Rimini’s words, property often involves a “piracy of the strong that gives birth to hierarchy and reinforces it” (2018, p.51). The CSLCA is thus itself a piratical act of neoliberal appropriation, pre-emptively stealing from the common heritage of humankind.

20th century assertions of US dominance in the global commons of air, sea and space are being re-animated through the private space economy. This intractable linkage between the sovereign power of the state and the economic power of corporations harkens back to the colonial era and the sovereign claims of the privateer and charter corporation. Colonial mineral sovereignty further underlines the fact that the Manichaeian binary of the heroic entrepreneur and the tyrannical state is unrealistic in practice. Perhaps the most significant ‘geo-myth’ within NewSpace and neoliberal ideology is the notion that economic growth can continue indefinitely. The expansionist, post-limits utopia of NewSpace – empowered by the US state and the Atlas Network – is the focus of the following chapter.

6. To go in peace for all Earthkind...

“If we run out of space for our burgeoning race,
No more Lebensraum left for the Mensch,
When we’re ready to start we can take Mars apart,
If we just find a big enough wrench.”

Home, Home on Lagrange, Higgins and Gehm 1979

Physicist Bill Higgins and biochemist Barry Gehm wrote the unofficial anthem of the L-5 Society. Sung to the tune of ‘Home, Home on the Range’, it was usually accompanied by ukulele and was once performed “knee-deep in a wading pool filled with dry ice, illuminated by laser beams” (Higgins and Gehm 1979, p.3). It concisely melded techno-utopian discourses of mastery over nature with geomyths of unlimited growth into a playful, if facetious, ditty. A more endearing chorus speaks to L-5’s early links to West Coast counter-culture, and mercifully eschews any further vocabulary from the geopolitics of the Third Reich.

“Home, home on Lagrange,
Where the space debris always collects.
We possess, so it seems, two of Man's greatest dreams,
Solar power and zero-gee sex,” (Higgins and Gehm 1979, p.3)

Like fast food logos on a space-bound rocket, the unofficial L-5 anthem is characteristic of a movement that teeters between the sublime and the ridiculous.

We have discussed how NewSpace projects its ideals of individual liberty and economic freedom onto the exotic temporal and spatial horizons of inter-planetary space. Yet the aporia at the heart of NewSpace cosmopolitics is consistent with the neoliberal political project. NewSpace’s reliance on the sovereign power of national government and the support of the taxpayer is disguised under pirate fantasies and the valorisation of the entrepreneur and the ‘free’ market. NewSpace actors have dismissed the claim that space colonisation is an “escape hatch for the rich” (Musk, in Allen & VandeHei 2018) or that the CSLCA represents “a [further] step towards American domination and hegemony in space” (Kfir 2016). Does a

colonisation project founded on private property really aspire to support a ‘burgeoning’ species, or is it more likely a project in lining the pockets of a select few members? As Shammass and Holen note, NewSpace does not herald the off-worlding of *Gattungswesen*, or the ‘species-being’ of humanity, but rather a “specific set of entrepreneurs” venturing forth while “carrying a particular ideological payload” (2019, p.5). The cosmopolitan, salvationist rhetoric of NewSpace is discordant with their undermining of international laws of the space commons and their evident support from the neoliberal think-tanks of the Atlas Network.

In this chapter we will return to another paradox of NewSpace: its post-limits environmental imaginary, where the cosmic frontier offers deliverance from planetary ecological catastrophe. The NewSpace network has appealed to environmental conservation as a justification for off-world migration and industrialism, ever since Gerard O’Neill responded to the predictions of the first *Limits to Growth* report (O’Neill 1977; Meadows et al. 1972). In the words of the Space Frontier Foundation, the colonisation of the Solar System will “not only preserve the biosphere of earth by using the resources of space” but will present the opportunity to transport “life to worlds now dead” (SFF, in Tumlinson 2003, p.2). The National Space Society (a descendant of the L-5 Society) warns of numerous existential threats to human and non-human life on Earth:

“The human species is encountering increased natural, man-made, and extraterrestrial threats, including disease, resource depletion, pollution, urban violence, terrorism, nuclear war, asteroids, and comets...Many forms of animal and plant life on Earth are suffering increased loss of population and quality habitat because of the growing presence of humans on planet Earth, via expansion, pollution, deforestation, fishing, farming, mining, and promotion of certain species of animals and plants...Space industrialization and settlement provide safety valves to relieve the pressures that cause Earth-bound threats. They also provide escape routes in case of catastrophic man-made or extraterrestrial threats. Humanity has inherited the stewardship of the planet Earth. It will therefore need the vast resources of outer space to reverse the damage it has caused to the Earth’s biosphere, and ultimately enhance all life on Earth” (NSS 2019).

NewSpace’s anticipatory discourse is eschatological or millenarian in nature: it envisions apocalyptic and world-transformative future events while optimistically positing unrealised space technologies as the source of salvation. A ‘rapture of the nerds’, to borrow an expression from the more irreverent quarters of science fiction literature (e.g. Doctorow & Stross 2012).

How do we interpret NewSpace biopolitics? In the first half of this chapter, I will demonstrate that NewSpace environmentalism rests upon the ‘techno-fix’: a mode of problem-solving that defers action on immediate ecological crises through the assumption of future technological progress (Clark & York 2013). Like ‘clean coal’ or geoengineering, NewSpace represents a case study in neoliberal environmentalism, where the market is presumed to be superior to the state as an architect of solutions to environmental problems (Mirowski, Walker & Abboud 2013). I will argue that NewSpace biopolitics is actually ‘post-biological’. NewSpace techno-utopianism involves an assumption that the biophysical limits of Earth and the human body can be overcome through private sector innovation, such that there is no need for a global steady state economy and the attendant constraints of international law. In this sense, NewSpace eschatology resonates with mystic philosophies like Singularitarianism or noöspherism: hypothesised, future evolutionary stages of humankind in which we transcend our connection to the biosphere (Vernadsky 2012 [1938]; Teilhard de Chardin 1964).

NewSpace’s project of ‘ecological salvation by space colonisation’ is undermined by the inherent elitism of its eschatology and the way in which the CSLCA undermines international laws of the global commons. The irony in the NewSpace ‘rapture’ is that we can attribute many of the crises facing humanity to the very remedies they have proposed for the off-world: extractive industry and the unyielding, largely unfettered exercise of mineral sovereignty (Walker & Johnson 2018). In the second half of this chapter, I will offer some policy recommendations that represent more pragmatic and egalitarian alternatives to the NewSpace techno-fix – a pathway towards more inclusive and sustainable futures on Earth and the off-world frontier. For this, we will return to Karl Polanyi and his notion of the ‘double movement’ – the social and political institutions that can protect against the deleterious effects of neoliberalism (2001 [1944]). Following Nanda and Ris (1976) and Baslar (1998), I propose the public trust doctrine (Sax 1969) as a governance regime for the global commons of Earth and as an alternative to the unilateral private property regime of the CSLCA. I argue that if we establish global commons and mineral estates as public trusts, predicated on the protection of intergenerational rights and an ethics of stewardship, we might be able to defend humankind’s common heritage on Earth and in space against the tide of neoliberal constitutionalism.

6.1 NewSpace biopolitics: planetary crisis meets transcendence fantasy

NewSpace actors have argued that endogenous crises (such as ecological collapse produced by industrial pollution, population growth and resource depletion) and exogenous threats (such as meteor impacts) could be mitigated by opening the space frontier to commercial exploitation and human habitation (e.g. Space Renaissance USA 2020 [2011]). NewSpace engages with environmental problems through what have been called ‘techno-fixes’ and anticipates that the fundamental biophysical limits of both the planet and the human body can be transcended through technological innovation (Cooper 2007; Clark & York 2013; Walker & Granjou 2017). Reminiscent of Enlightenment progress ideology, there is a faith-like confidence that technology and the market will inevitably deliver us from evils of our own making – a teleological grand narrative promising a future of infinitude and abundance that Walker (2007) has similarly identified in neoliberal growth theory. Space colonisation is perceived to be humankind’s ultimate destiny, where techno-capital will transcend the bonds of Earth and the worthy entrepreneurial elect ascend to pioneer the infinite frontier. I will explore similarities between NewSpace and Singularitarianism, a techno-utopian movement resting on even more ‘post-biological’ foundations. These two movements have over-lapping social networks and share techno-mystic philosophical tenets. I demonstrate how they appear to draw on the ‘noösphere’ concept: a teleological account of societal evolution predicated on the triumph of reason (Vernadsky 2012) and the transcendence of mortal limits (Chardin 1964). Seen in this light, space mining and colonisation appear as means to escape Earth rather than to save it.

6.1.1 *The biophysical limits of Earth and NewSpace ‘techno-fixes’*

NewSpace techno-utopianism posits space colonisation as a means of mitigating the risks of planetary ecological collapse and ‘fixing’ anthropogenic environmental degradation. In spite of copious technological hurdles, NewSpace philosophy treats such a solution as preferable to regulatory mechanisms. As we explored earlier (section 1.2.1), Gerard O’Neill’s space utopianism was spurred by the first *Limits to Growth* report (Meadows et al. 1972). O’Neill thought space colonisation could “protect the biosphere from damage caused by transportation and industrial pollution” (1974, p.36), while also dismissing the regulatory and governmental mechanisms of the ‘steady state’ economy as a viable alternative (1977). In the

NewSpace paradigm, to work within terrestrial biophysical limits means accepting limits imposed by regulation and any global governance, resource re-distribution or environmental management that it might entail. The Space Frontier Foundation (SFF), for instance, muse that:

“Five hundred years after the beginning of Age of Enlightenment, society has merely expanded the size of its mental prison, and all current thinking is trapped in the cage of earth and its biosphere. This is a cage in our minds. It is this idea lurking behind such phrases as ‘limits to growth’ or today’s vogue term in social planning circles: ‘sustainable growth’... Proponents of this view plan for all of the world’s people to live under a global set of rules designed to limit our inevitably increasing damage to the biosphere. They hope to ‘manage’ human society through treaties and agreements that percolate down to the level of local laws... We can sustain the growth of the human species and the other life of planet Earth only by bursting the bubble. We must open the space frontier” (Tumlinson & SFF 1995).

The SFF are correct in pointing to the fallibility of attempts to achieve ‘sustainable growth’ on a finite planet (Tumlinson & SFF 1995). There is here a failure to acknowledge that reducing Western patterns of energy and resource consumption are an alternative option to leaving Earth. Responsibility for the Anthropocene is unevenly distributed, and ‘we’ are not ‘inevitably’ damaging the biosphere (Walker & Johnson 2018, p.57). Furthermore, the SFF have previously collaborated with the Cato Institute (Hudgins 2002), who have actively campaigned against environmental law and pollution controls (a deliberate and more literal bursting of the life-supporting atmospheric ‘bubble’).

It is important to note here that, across NewSpace organisations and their investors, there are divergent views on the most pressing of environmental challenges: climate change. For example, the Space Development Foundation has followed in O’Neill’s footsteps by emphasising space-based solar power as a solution to climate change (SDF n.d.). The Lifeboat Foundation, meanwhile, appear to support solar power generation on Earth, rather than solely through O’Neill’s highly speculative framework (Lifeboat Foundation 2020a). Planetary Resources briefly pursued small-scale hybrid power generation through their Planetary Power start-up, which sought to improve access to power in remote communities (CrunchBase 2020). By purchasing and expanding SolarCity and Tesla Motors, SpaceX’s Elon Musk has fuelled the proliferation of commercial solar panels, storage batteries and electric cars. Alternatively, the political donations made by Jeff Bezos’ Amazon.com to climate denying legislators – and the carbon emissions of the company itself – have likely

done more damage to the atmosphere than ‘going to space to save Earth’ will be able to repair (Mahadevan 2019; Chasan 2019; Bezos, in Blue Origin 2019). Moon Express and Planetary Resources backer Peter Thiel has recently provided \$1.7 million in funding for the journal *Inference*, which has started publishing pseudoscientific denials of climate change amongst more credible research papers (Becker 2019). The Founding Declaration of the Mars Society (2020 [1998]) noted how comparatively planetology of Earth and Venus illuminates the threat of greenhouse gases. Yet the Society’s founder and current president, Dr Robert Zubrin, rejects the science of climate change, pillorying Oreskes and Conway’s (2010) *Merchants of Doubt* with his *Merchants of Despair: Radical environmentalists, criminal pseudo-scientists, and the fatal cult of antihumanism* (Zubrin 2013).

Despite the evident interest in deploying technological solutions for climate change on Earth in some organisations, NewSpace’s broader environmental imaginary ultimately rests upon a project far more elaborate: space colonisation and the ‘off-worlding’ of industry. Space industrialisation has featured in NewSpace discourse as a means of displacing carbon-intensive industry on Earth. The science fiction luminary Isaac Asimov had espoused the potential for space industrialisation in reducing atmospheric pollution (1985). Writing in a paper for NASA’s Langley Research Center, at a time when the Reagan Administration would vehemently undermine anti-pollution laws, Asimov noted that “we are in danger of poisoning the entire atmosphere” (1985, p.88). He nonetheless emphasised techno-utopian solutions: “when we have a factory in space, any unavoidable pollution that it produces can be discharged into space” (ibid, p.88). For Asimov, it is only a question of ‘when’ technological change would render this feasible. Like Karl Polanyi, he deployed William Blake’s evocative description of the Victorian workhouses, but was less interested in the historical processes that blanketed London in the poisonous fog of waste output – he thought that by off-worlding polluting factories and mines, “perhaps Earth can get rid of its ‘dark satanic mills’...without abandoning industrialisation” altogether (ibid, p.88).

Asimov’s ‘space industrialisation’ fantasy bridges the science fiction inspirations behind NewSpace and the neoliberal commitment to endless economic growth. This environmentalism-through-space industrialisation is perpetuated across the NewSpace network. Harrison Schmitt, the Apollo 17 geologist-astronaut and former board member at the neoliberal Heartland Institute, has argued that the Moon’s helium-3 reserves offer an unlimited source of clean energy (2006). Planetary Resources’ promotional work frequently claims that space mining could (beneficially) expand extractive industry’s resource footprint

beyond Earth orbit (Planetary Resources 2012; Orsulak 2018). One of the company's executives has recently combined Asimov's off-worlding of all industrial processes with the O'Neillian vision of orbital megastructures:

“We can move our industrial manufacturing into space. All of it. You see, manufacturing is resource consumption: we use the resources of Earth, we turn them into manufactured products... What if we gather and harvest all of our raw materials and resources from deep space, and import them to an orbit manufacturing ring around the planet, and then return only the finished product to the surface? ... So if we do this – we reverse the human supply chain, we push all of our mining, our manufacturing, outside of the atmosphere – what have we done? We have now zoned the Earth for residential access only” (Orsulak 2018).

Yet space industrialisation is so far from being realised that it is not a viable solution for preserving Earth as a liveable planet, in light of the stark, short-term imperative of rapid and widespread decarbonisation. Given the expenses of the Apollo Program and the failure of commercial spaceflight to achieve more than the (comparatively unambitious) goal of temporarily re-locating a handful of people off-world at a time, the notion of transporting all polluting industry into outer space is nonsensical. Whilst Orsulak's comments are clearly marketing hyperbole, they are nonetheless emblematic of NewSpace's general disinterest in addressing the underlying causes of ecological degradation.

Indeed, the colonisation of space is a future-projected techno-fix that defers resolution to the underlying causes of environmental degradation by assuming exponential (and beneficial) technological change. In the words of political ecologists Clark and York, proponents of techno-fixes attest that “there is no need to radically transform the social order, as the market will ensure that a technological fix is created to address each environmental problem” – space mining is another “technological panacea [that] obscures the anti-ecological tendencies of the capitalist system” (2013, p.23). NewSpace techno-fixes involve both saving the Earth through the mass migration of people and polluting industry, and a ‘Plan B’ of quarantining of human and non-human life on other planets – a hedging strategy against planetary catastrophe. If we could transport biodiverse genetic material off-world and somehow propagate it outside the atmosphere – even going so far as to ‘terraform’ other celestial bodies of the Solar System – we’d be “backing up the biosphere” and avoiding an ecological equivalent to the Alexandria library fire (Diamandis, in Hoffman 2010). Terraforming projects are an extension of geoengineering, and propose manipulating the atmospheres and geochemistry of other celestial bodies (predominantly Mars) in order to

recreate life-supporting planets elsewhere in the Solar System.¹⁰¹ As Cooper notes, “It is no coincidence that the dream of terraformation has arisen at a moment in history when capitalist modes of production are literally testing the limits of life on earth” (2008, p.39).

NewSpace can be read as a neoliberal environmentalist project: it offers market-based solutions to problems that have been created by capitalist markets (Mirowski 2009, p.439). Neoliberal environmentalist discourses hold that “entrepreneurs will innovate market solutions to address dire environmental problems” (Mirowski, Walker & Abboud 2013, p.85). NewSpace start-ups are an emblematic example of what Mirowski, Walker & Abboud have called the “whiz-bang futuristic science fiction side of neoliberalism, seed-financed by inspirational billionaire ‘thought leaders’” (ibid, p.85). Yet neoliberal environmentalism is, in practice, an oxymoron: innovations range from the ineffective carbon trading permit through to phantasmic ‘clean coal’. The techno-fix approach to environmentalism is evidently more suitable for accumulating capital than for alleviating anthropogenic pressures on a finite planet.

6.1.2 The elitist eschatologies of NewSpace and neoliberalism

NewSpace ideology is frequently eschatological in scope. Eschatology comes from the Greek ‘eschatos’ or end, it means “doctrine of last things” (Walker 2007, p.83). Perhaps the archetypal example of eschatological thought is Christianity’s Book of Revelations and the anticipated Day of Judgement. Despite its claimed grounding in the ‘hard sciences’ of engineering, physics and mathematics – and the ‘dismal science’ of economic orthodoxy – there is an apocalyptic or millenarian undertone to NewSpace’s “*urgent* orientation toward a future of space settlement” (Valentine 2012, p.1049, italics in original). Yet NewSpace frames this urgency in positive terms through what John Bozemann has termed ‘technological millenarianism’ – “the opinion that technology will bring about a new golden age in the near future that will create a substantial, and permanent, fundamental improvement in the human condition” (1997, p.151).

In addition to the ‘capitalogenic’ risks discussed above (Moore 2015) and other endogenous risks like nuclear war or rampant artificial intelligence (e.g. NSS 2018; Lifeboat Foundation 2020), NewSpace actors often point to exogenous sources of a planetary

¹⁰¹ Terraforming Mars has featured prominently in NewSpace and planetary science more broadly, such as the work of Carl Sagan (1973) and the blue-sky speculative research conducted at NASA Ames (Cooper 2007).

judgement day. Asteroid impacts feature prominently in attempts to make off-world colonisation seem like an urgent imperative (e.g. Kfir 2016), in particular the Chicxulub impact that prompted the Cretaceous–Paleogene extinction event 66 million years ago (the end of the dinosaurs). Perhaps invoking ‘dinosaurs’ serves a twin purpose by simultaneously implying that space mining’s critics are Luddites unable to appreciate the NewSpace vision. Gamma-ray bursts (GRBs) are also mentioned as another end of days scenario (NSS 2018). GRBs were discovered by US military scientists who were actually looking for Soviet violations of the *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water* (1963). They are brief but massive ejections of highly energised light originating from massive collapsing stars – the energy output of GRB990123, for instance, was estimated as “one hundred quadrillion times more luminous than the Sun” (NASA 2013). Should Earth happen to be in the path of a nearby GRB, the ozone layer would be eviscerated and the planet scorched with ultraviolet radiation (Gronstal 2016). Fortunately, the likelihood of that happening is low – most identified GRBs have been observed in other galaxies, and none of Earth’s neighbouring stars appear on the verge of collapse. Similarly, the risk of ‘planet killing’ asteroid impacts is significantly lower than localised city or regional-level damage (National Science and Technology Council 2018, pp.2-4).

Neoliberalism also involves an eschatological dimension. Walker (2007) describes the millenarianism of neoliberalism, where the invisible, god-like hand of the market will deliver abundance and prosperity, so long as it is left unimpeded by government regulation and taxation. “If enough ‘deregulation’ occurs, ultimately ‘everyone will become rich’” (Walker 2007, p.83). Free market capitalism has its own mythic and mystic dimensions. Orthodox economic theories of neoclassical and neoliberal economics offer a cosmological model that seeks to explain the totality of human existence. In Gordon Bigelow’s words:

“...it is economics that offers the dominant creation narrative of our society, depicting the relation of each of us to the universe we inhabit, the relation of human beings to God. And the story it tells is a marvelous one. In it an enormous multitude of strangers, all individuals, all striving alone, are nevertheless all bound together in a beautiful and natural pattern of existence: the market” (in Walker 2007, p.80).

It is at times a more “mundane” eschatology, where this anticipation of future prosperity is usually expressed in terms of quarterly GDP figures – but nonetheless it employs “the millennial sense of expectation oriented toward a future temporal horizon” that we also see in NewSpace eschatology (Walker 2007, p.93, p.79).

Whereas NewSpace anticipates a bypassing of planetary limits, the economic orthodoxy underpinning neoliberalism is entirely blind to them. The intellectual heritage of many Mont Pèlerin Society members – notably founders like Friedrich Hayek and Milton Friedman – includes a formal economists’ education in neoclassical economics (though neoliberalism cannot be elided with neoclassical economics, of course). In neoclassical economics, capitalism and nature are effectively separate systems – as a result, the economy is not bound to any natural, planetary limit. Rees has noted the “near doctrinaire position among neoclassical economists that technology can substitute for both resources and environmental functions” (1999, p.208). Cirillo, meanwhile, notes how neoclassical economist Leon Walras had essentially removed land from a neoclassical model of economic exchange, reducing ‘the economy’ to a two-factor model of capital and labour (Cirillo 1980). Land and natural resources become simply a form of capital. If nature is infinitely convertible into other forms of capital, then innovation, wealth accumulation and industrial pollution can increase exponentially (Walker 2007, p.176, p.178). NewSpace’s eschatological expansionism represents a realisation of the ‘landless’ neoclassical-neoliberal economy by moving industry to a place where there is no land, no biological nature and an infinite ‘sink’ for pollution outputs.

The NewSpace goal is to provide “citizen access” to space (Spencer, cited in Parker 2009, p.90), while neoliberalism promises that the benefits of corporate freedoms will ‘trickle down’ for the rest of humanity. But would the off-world ‘rapture’ really be open to us all? In Christian eschatology, rewards of immortality and abundance were only granted to the worthy. Neoliberal reforms pursued since the Reagan and Thatcher governments, like tax breaks at the highest income brackets and the resultant disparities in global wealth distribution (in conjunction with paternalistic punishments for the poor), bestow rewards to the ‘faithful’ captains of industry and their shareholders. The elitist escapism in NewSpace, meanwhile, can be traced to O’Neill’s *High Frontier* (1977). O’Neill intended to resolve social conflict through an off-world segregation of interest groups, seemingly an escape from deliberative democracy and political compromise. In his words, the “space communities would be in contrast to the classical Utopias in part because [the pilgrims] could escape so much more successfully” (1977, p.198).¹⁰²

¹⁰² Kilgore (2003, p.172) notes that, for all the physics and mathematics, O’Neill’s project amounted to the most elaborate ‘gated community’ ever devised. Since he was also concerned with the social unrest and urban crime of 1960s and 70s America, O’Neill proposed a pilgrimage to the High Frontier that mirrored ‘white flight’

“What chance will we have, though, here on an Earth ever more crowded and more hungry for energy and materials, to allow for diversity, for experiment, for groups to try in isolation to find better lifestyles? What chance for rare, talented individuals to create their own small worlds of home and family, as was so easy a century ago in our America as it expanded into a new frontier?” (ibid, p.43).

The O’Neillian project represents a fusing of Francis Bacon’s New Atlantis – an autonomous refuge for the intellectual elite – and the Mayflower myth of the virtuous pilgrim colonist. The frontier becomes as a site of social experimentation and escape, but not for everybody.

Planetary Resources’ CEO Peter Diamandis is a vocal prophet of the techno-utopian golden age. His book, *Abundance: The future is better than you think* rails against the bleakness of limits discourse, albeit while acknowledging that “we are still finding proof of [the Club of Rome reports’] veracity most places we look” (Diamandis & Kotler 2012, p.7). As with O’Neill, who he had met while founding the Students for the Exploration and Development of Space organisation, this acknowledgement of limits is drowned out by techno-optimist millenarianism:

“Humanity is now entering a period of radical transformation in which technology has the potential to significantly raise the basic standards of living for every man, woman, and child on the planet. Within a generation, we will be able to provide goods and services, once reserved for the wealthy few, to any and all who need them. Or desire them. Abundance for all is actually within our grasp” (ibid, p.9).

To take the benefits of technological change beyond the grasp of ‘the wealthy few’... This is a humanitarian impulse scarcely believable from a person heads a company that has expended substantial funds lobbying the US Congress to ensure that the benefits of the space harvest accumulate in private hands. The supposed commitment to ‘benefits for all mankind’ clashes with what often appear like zero-g recreations of Ayn Rand’s ‘Galt’s Gulch’, the refuge for the virtuously selfish entrepreneur (Rand 2005 [1957]). Much like Christianity’s rapture, ascending to the off-world via private property claims will most likely be a reward for the elect.

from inner-city areas. The Lifeboat Foundation, have explicitly described their proposed orbital colony as “the ultimate gated community” (Lifeboat Foundation 2020).

6.1.3 *The mortal limits of the human body*

If such an off-world exodus is to eventuate, NewSpace techno-fixes also need to address the biological limits of the human body in the sheer inhospitableness of outer space. The requirements of human life include: a pressurised, breathable atmosphere; ample water, food and gravity; and protection from cosmic and solar radiation. For all these physiological ingredients for human existence, we are fundamentally reliant on the atmosphere, biosphere and magnetosphere, respectively. To use Schmitt's (androcentric) words, "the human is a son of the earth, and so he shall remain as long as he remains human" (2015, p.81). To reiterate the difficulty of living outside Earth's protective spheres on the off-world *todesraum* (section 2.3.2), we can look to the colossal expense involved in maintaining the *International Space Station* (ISS) – only a small living space within Earth's gravity well.

NewSpace claims that the hazards of outer space will inevitably be overcome through creativity, innovation and entrepreneurialism. Gerard O'Neill designed vessels that rotated to generate centrifugal force and produce artificial gravity (O'Neill 1974, p.32). This might mitigate the loss of muscle and bone density caused by microgravity environments (and the need for astronauts to perform 5 hours of exercise per day). It might also help reduce the tendency for internal organs to become more spherical and less effective during extended stays in space (May et al. 2014). Water ice derived from asteroid mining could be chemically separated into breathable oxygen (NSS 2012, p.15). Another, more speculative solution is to use cyanobacteria to photosynthesise oxygen from carbon dioxide (Worden 2009, p.23). The lack of a magnetosphere makes human and non-human life vulnerable to the carcinogenic mutations produced by galactic cosmic rays and solar energetic particles (National Research Council 2006). K. Eric Drexler, a nanotechnologist, former L-5 Society activist and protégé of O'Neill, had proposed *in situ* manufacturing of protective shielding for spacecraft and habitats using barriers of asteroidal rock and 'soil' (Drexler 1983). The promise of technology means that, for NewSpace, the market will always find solutions to what appear as insurmountable barriers to living off-world.

NewSpace's techno-libertarian aversion to space bureaucracy seems to downplay the history of public sector technoscience in approaching off-world life-supports. Mazzucato's (2013) history of the 'entrepreneurial state' reveals that many core innovations of the ICT industries derived from direct state patronage. And, in addition to the real achievements of the Apollo Program and the ISS, US Government programs were equally capable of 'blue

sky' musings about how to address the hostility of space. In 1963, NASA commissioned defence contractor United Aircraft to undertake the *Engineering Man for Space: The Cyborg Study* report (Driscoll 1963; Launius 2010). The study took the view that, rather than make space safe for astronauts through habitats, the human body could be engineered to adapt to the space environment. The project investigated "reducing metabolic demands and attendant life support requirements" through artificial lungs, hearts, and kidneys, while induced hypothermia could act as a metabolic retardant and pathway to suspended animation (Driscoll 1963, p.76). Ultimately, the project concluded with an acknowledgement that such technologies were "beyond current capabilities" of the 1960s (Launius 2010, p.126).

In the decades since, engineering artificial biospheres has proved as challenging as 'cyborg studies'. In 1991, a Texan oil magnate funded the Biosphere II experiment in Arizona, which attempted to house 8 people in fabricated, closed ecosystems with only sunlight as an external input. After 15 months, it was apparent that the closed system was unable to produce enough oxygen for the 8 people sealed inside, and the experiment was deemed a failure (Launius 2010, p.125). More recently, Walker and Granjou (2017) describe the European Space Agency's Micro-Ecological Life Support System Alternative (MELiSSA) experiment, which is researching artificial closed-loop biospheres for sustaining astronaut crews on long-distance missions, "aiming to achieve a complete and continuous conversion of human wastes into edible biomass, drinking water and breathable air" (Walker & Granjou 2017, p.62). Such a project requires a steady state of 100% recycling and regeneration of life supports (air, water and food), in addition to deep space astronauts' psychological tolerance for these processes during year-long journeys to neighbouring celestial bodies. The closed-loop production systems required by space travel are entirely anathema to NewSpace's prerogatives of infinite extraction and consumption (ibid, p.61). The central problematic for O'Neillian space environmentalism is that, while industrial civilisation has unintentionally engineered a dying Earth, no one is currently capable of engineering a life-supporting micro-ecology that supports human life in space.

6.1.4 The Singularity, neoliberalism and the noösphere: transcending the biosphere and human biology

Neoliberal capitalism's prerogative of infinite accumulation – particularly as manifest in mining – is discordant with NewSpace's roots in the supposed 'knowledge economies' of the information and communication industries. The tech entrepreneur believes himself to deal in incorporeal ideas and 'solutions', not the biophysically irreversible exercise of geological power (Vernadsky, in Guillaume 2014, p.138). Techno-utopian faith in reason and innovation is not grounded in ecological reality, but rather technological infinitude. There is an evident tension between disembodied 'knowledge economies' and the Anthropocene, this latest chapter in deep history that is being written by the key agents of extractive capitalism. In the face of planetary crisis and human mortality, movements like NewSpace and Singularitarianism believe in The Promise that the biophysical limits of the Earth and the body will inevitably be overcome.

The concept of the noösphere is helpful for conceptualising this ideational/materialist disjuncture at the core of NewSpace techno-fixes and eschatology. The noösphere is also a helpful framework to explore the mystic and mythological inclinations of techno-utopian movements more broadly. The noösphere was developed, in part, by Vladimir Vernadsky – the progenitor of the Anthropocene concept whom we discussed in relation to the geological power of mineral sovereignty (Chapter 3, introduction). Like NewSpace progenitor Konstantin Tsiolkovsky, Vernadsky was a cosmist philosopher. Siddiqi describes cosmism as a techno-utopian philosophy focused on “the evolution of both humanity and the universe and the relationship between the two”, merging Bolshevik emancipatory imperatives with orthodox Christian concepts of resurrection and immortality (Siddiqi 2008, p.265). The noösphere was that “era of reason” that Vernadsky had used to describe humanity as a geological force re-shaping the Earth (in Guillaume 2014, p.138). Davis summarises the Vernadskyian noösphere as the belief that “planetary evolution was passing from a stage determined by biological laws to one moulded by conscious human activity” (Davis 2015, p.306). Noösphere translated from Greek as ‘mind sphere’ or ‘thinking stratum’ – Vernadsky considered humanity's technoscientific mastery of nature to be “the final stage of Earth's evolution driven by the powers of interconnected human minds” (Savelyeva 2017, p.506).

Vernadsky's use of the term – which he first used in a work that introduced a more significant terminological innovation, *The Biosphere* (1926) – owed much to his tenure at the

Sorbonne University in Paris. In Paris, he engaged with colleagues such as the mystically inclined mathematician Édouard Le Roy (to whom he credited the term) and the Jesuit palaeontologist Pierre Teilhard de Chardin (Savelyeva 2017, p.506). Tamar Savelyeva (2017) has charted a genealogy of non-Western sustainability discourses and draws attention to two different strands of ‘noöspherism’. For the pioneering geochemist Vernadsky, the noösphere was anthropocosmic in locating human origins “in the depths of the universe” and it was a “purely scientific notion” (ibid, p.506-7). In Vernadsky’s words:

“...we can distinguish an expression of the influence on the structure of the noösphere of two areas of human thought: the sciences common to all reality (physics, astronomy, chemistry, mathematics), and sciences related to the Earth (biological, geological, and humanistic sciences)...Science has a real existence, and like Man himself, is most closely and inextricably bound to the noösphere. The individual is obliterated – ‘decomposed’ – when he goes beyond the logical grasp of his intellect” (Vernadsky 2012, p.30-31).

Regardless of the primacy of human cognition in the Vernadskyian noösphere, it is nonetheless comparable to the telluric accounts of political community of Schmitt and Polanyi. As Hamilton & Grinevald describe it, Vernadsky’s noösphere was a conceptualisation of “collective consciousness tethered to the biogeochemical processes” that could be shaped “by a creature that *belonged* to the evolving biosphere” (2015, p.65, emphasis added).

Teilhard had also adopted the term in his writing (Teilhard de Chardin 1964), and his work constitutes a second strand of noöspherism (Savelyeva 2017).¹⁰³ In contrast to Vernadsky, Teilhard emphasised the spiritual dimensions of this supposed societal evolution towards a noösphere, and it was “anthropocentric, keeping the human-nature relationship in dominance of the former” (Savelyeva 2017, p.506). The Teilhardian noösphere appears to have fused the Cartesian mind-over-matter dualism with Christian notions of ‘impurity of the flesh’. For Teilhard, the noösphere was an eschatological end goal he called the Omega Point, the “final maturing and ecstasy of Mankind” (Teilhard de Chardin 1964, p.127). In his investigation of techno-mysticism, Eric Davis (2015) eruditely summarises the Teilhardian noösphere:

¹⁰³ Davis notes that, as a Jesuit priest with an interest in evolution, Teilhard may have “tap-danced on the thin ice of heresy” – however, given his role in the debunked ‘Piltdown man’ paleontological discovery, “it would be wrong to accuse Teilhard of practicing science” (2015, p.308, p.306).

“Teilhard was a global perfectionist who believed that the divine progressively realized itself through the lumbering machinery of history, technological as well as natural. Teilhard’s mysticism thus fused two contradictory vectors of the Western spirit: the world-denying ascent toward transcendence and the headlong plunge toward the total domination of matter.” (Davis 2015, p.308).

Rather than being tethered to the biosphere, Teilhard’s noösphere accentuated human capacity for reason by insisting that the ‘thinking stratum’ would eventually and inevitably separate itself and exist “outside and above the biosphere” (Teilhard de Chardin 1964, p.163).

It is the teleology of the Teilhardian noösphere that resonates more strongly with the escapism and infinitude of NewSpace’s space colonisation project. Hamilton and Grinevald argue that Teilhard was not a precursor to the Anthropocene concept, and suggest that:

“If for Teilhard the noösphere represented the power of the whole of humankind’s consciousness raised above and purified of its earthly connections, the Anthropocene in the approach of Earth system scientists – for whom explosive human population and its total industrial metabolism have become an accelerating force of nature – has dragged consciousness back into the Earth” (2015, p.68).

Teilhard’s noösphere thus stands in contrast to Vernadsky’s embedding of consciousness in the biosphere, or indeed the contemporary political movements that seek to protect Earthly commons. This is clearly not the case for NewSpace advocates of the off-world techno-fix, who prefer to accentuate ‘spirits’ of innovation and entrepreneurialism (Zubrin 1994; Hudgins 2011). Karl Löwith described teleology as “an irreversible direction toward a future goal” (1949, p.54), and this aptly describes NewSpace’s assumption of radical technological improvement leading towards a future that is ‘better than you think’ (Diamandis & Kotler 2012). There is also a teleological dimension to NewSpace understandings of social-ecological relationships (e.g. Tumlinson & SFF 1995; Space Renaissance USA 2020 [2011]). Anthropogenic pollution here takes the form of an invisible hand of Malthusian inevitability that no legislative intervention could ever prevent. Again, the ‘inevitable’ trope neglects the support that NewSpace has received from actors within the Atlas Network, which has organised obstruction to the fortification of environmental consciousness within binding international law.

We can see some philosophical and political overlap between NewSpace and other extropian movements. Davis describes Teilhard’s noösphere as “a kind of theological Extropianism”, a “synthesis of science and spirit” that “molded together Darwin and the

divine” (Davis 2015, pp.308-9). Contemporary extropianism is manifest as a techno-utopian belief system that effectively opposes the second law of thermodynamics, or the entropy law: that any natural system has an inherent tendency towards the dissipation of useful energy, an inexorable movement towards “irreversibility, depletion, waste and disorder” (Walker 2007, p.30). Extropianism, conversely, is defined by its adherents as “the extent of a living or organizational system’s intelligence, functional order, vitality, and capacity and drive for improvement” (Extropy Institute 2005). Like the ‘visioneering’ of NewSpace (McCray 2013), extropian movements overlap with more sober academic disciplines – the computational and life sciences, for example. Extropians prophesise (and patent) accumulative improvements in vitality and intelligence in the hope that the human body can be transformed for an era of ‘post-humanity’. They draw on an array of scientific knowledges and practices that are diverse in their veracity: cryonics, nanotechnology, life extension, genetic engineering, artificial intelligences and Singularitarianism.

Singularitarianism is an extropian movement that shares similar assumptions and beliefs with NewSpace, and a similar social and financial network. The notion of ‘the Singularity’ is borrowed from cosmology and mathematics: a point in time and space beyond which exponential change is possible and does not conform to preceding rules and patterns (Shanahan 2015, p.xv). Originating with science fiction writer and mathematician Vernor Vinge, the technological Singularity represented “the point at which greater-than-human machine intelligence begins rapidly improving itself, bringing an end to human-directed history” (Hughes 2012, p.763). Today, Ray Kurzweil, Google’s Director of Engineering, is Singularitarian-in-chief. In his *The Singularity is near: when humans transcend biology* (2005), Kurzweil draws heavily on Moore’s Law, the teleological notion of ‘accelerating returns’ in innovation and computing power. There is an apocalyptic scenario that many activists and texts have attached to the Singularity, simultaneously lauding human mastery over nature while fearing its obsolescence through or oppression by machine intelligence (Farman 2012). As anthropologist Abou Farman (2012) has noted, Singularitarianism also heralds the communion of humanity with high technology, ushering in a new age of peace, plenty and prosperity. The Singularity is hypothesised to enable extending human lifespans, curing diseases, ending world hunger, bringing people and species back from the dead, and even allowing us to upload human consciousness into computers – leading to immortal “software-based humans” (Kurzweil 2005, p.243). The Terasem Movement, for example, synthesise a Singularitarian-NewSpace immortality fantasy, proposing that ‘mind files’ such

as this could be transmitted to across the light-years of interstellar space and human beings reconstituted in new forms by (hitherto undiscovered) advanced technological civilizations (Farman 2012, p.1081).

Singularitarianism is even more fantastic than NewSpace in its dismissing of the biological. A contempt for the human body – ‘the meatsack’ – and mortal biology stems from Singularitarian post-humanity. Farman described the movement as attempting to take the self “beyond the wetness of its human platform” (2012, p.1084). This is reflective of the inherently androgenic nature of Cartesian dualism, as identified by feminist environmental theorists (e.g. Plumwood 2002). Yet unlike NewSpace, there are more pronounced progressive or socialist blocs within the broader extropian and transhumanist movements. Hughes (2012) details this egalitarian techno-utopian history: from the Marxist bioutopianism of geneticist J.B.S. Haldane that opposed the eugenics movement of the 1920s, through to contemporary ‘bioliberal’ and ‘technoprogressive’ members of the World Transhumanist Association, who have called for social democratic measures like improved access to emerging health technologies like bionic ears.¹⁰⁴

However, Singularitarianism has shifted towards a neoliberal idiom, and the Singularitarian network features some of our recurring characters.¹⁰⁵ With Kurzweil, Planetary Resources CEO Diamandis founded the Singularity University (essentially a start-up ‘incubator’) in NASA’s Ames Research Center in Silicon Valley. Larry Page, co-founder and CEO of Google, had contributed financial support to both Singularity U and Planetary Resources. Elon Musk has recently launched Neuralink, a start-up that researches brain-machine interfaces in the hope of reprogramming our neural code, helping us become one with our software innovations in an ‘if you can’t beat them, join them’ approach to artificial intelligence (Kosoff 2017). Peter Thiel, a financial backer of Planetary Resources and Moon Express, has managed to direct both his techno-neoliberal and religious conservative impulses into the Machine Intelligence Research Institute and the life-extension Methuselah Foundation (Hughes 2012). Thiel had funded a libertarian coup of the World Transhumanist Association (now Humanity+), helping to install fellow Seasteader Patri Friedman onto its

¹⁰⁴ Hughes also notes that Kurzweil is more liberal than Singularitarian figures like Thiel (2012, p.766); one of his first inventions was a print-to-speech reader for people with visual impairment.

¹⁰⁵ Farman (2012, p.1072) notes how a ‘who’s who’ of West Coast techno-utopians mingled at the early meetings of the L-5 Society, including some Singularitarian forefathers: Freeman Dyson (physicist, space activist and later climate denier), Eric Drexler (molecular nanotechnology), Marvin Minsky (artificial intelligence), Saul Kent (extropianism), Hans Moravec (robotics researcher and transhumanist) and William Sims Bainbridge (Singularitarian and NewSpace historian).

Board of Directors (Hughes 2012, p.766).

Through Singularitarianism, we can see the noösphere and the techno-fix resonating with neoliberal thought on an epistemological level (similar to the resonance of the landless NewSpace economy with neoclassical economics' landless model of economic relationships).¹⁰⁶ Neoliberalism's deified Market is itself a techno-mystic entity, a private property-based noösphere disembedded from the geosphere and biosphere. In Mirowski, Walker & Abboud's words, neoliberalism goes further than its neoclassical forebear in treating the market as an "arbiter of truth", a "self-organising system of distributed knowledge" that is "smarter than any human being" (2013, p.83). Hayek's (1950) model of market exchange asserted that it was the transmission and reception of price signals that coordinates buyers and sellers. He theorised the market as an omniscient information processor, allocating resources through the bits and bytes of the price signal in a 'spontaneous order' that was decentralised and superior to the centralised decision-making of the State. This idea of the Market as an omnipotent, autonomous force uncontrollable by the state resonates with the Singularity's mythology of exponential machine superintelligence.

For all of NewSpace's newfangled engineering innovations, its speculative techno-fixes have historical roots as deep as Russian cosmism. As early as the 1920s, the writing of Konstantin Tsiolkovsky (Vernadsky's contemporary) anticipated a future of human spacefaring and articulated a need for new frontiers and emancipation from Earth.

"We are further compelled to take up the struggle against gravity, and for the utilisation of celestial space and all its wealth, because of the overpopulation of our planet. Numerous other terrible dangers await mankind on the Earth, all of which suggest that man should look for a way into the Cosmos" (Tsiolkovsky n.d. [1920], p.372).

Tsiolkovsky simultaneously recognised the finite limits of the Earth while proposing speculative and fantastic possibilities for bypassing these fundamental constraints. Tsiolkovsky emphasised the dangers of a crowded planet, rather than the 'terrible dangers' that await humankind in the sheer hostility of outer space. Given that he was writing well before any humans had ever visited outer space, this rosy view of life on the space frontier can be forgiven. Contemporary NewSpace, however, continues with this techno-optimism in

¹⁰⁶ The idea of an immortal, digital self seems like an extreme realisation of neoclassical notions of methodological individualism and rationality. Singularitarians believe that the Singularity will make the flesh, blood and emotion of human experience reducible to data and information. Neoclassical economics, meanwhile, offers mathematical abstractions that reduce human interaction to the logic of market exchange.

spite of the obvious and numerous challenges that need to be overcome if deep space is to be of any use for Earthly environmental imperatives (at least, on a timeframe in which averting planetary ecological catastrophe is remotely possible).

In their appeals to terrestrial ecological conservation, I believe that NewSpace actors are deploying socio-political ‘window dressing’ to appeal to politicians and publics, and to mask largely individualistic or commercial motivations (Ormrod 2007, p.263). The speculative solutions proposed by NewSpace involve a human and non-human ‘species survivalism’ that is at odds with the emphasis on individual liberties and personal freedoms that appears in NewSpace discourse, and the instances in which NewSpace has rejected collective obligation in the form of common property and international law. NewSpace environmentalism also sits uneasily with the largely anti-environmentalist Atlas Network, which has continuously sought to capture state sovereignty in order to protect extractive industry from any ‘steady state’ curtailments of economic growth. If – in Tsiolkovsky’s words – humanity ever *needs* to ‘look for a way into the Cosmos’, the most likely reason will be unbearable changes to the Earth caused by unsustainable processes of industrial capitalism that are directed by those individuals and interest groups profiting from its extension. NewSpace biopolitics reflects what Melinda Cooper has described as ‘capitalist delirium’, predicated on “the breakdown and recreation of whole worlds...[The] delirium of contemporary capitalism...is intimately and essentially concerned with the limits of life on earth and the regeneration of living futures – beyond the limits” (Cooper 2007, p.28). When we consider that investment in NewSpace mining has predominantly arrived from capitalist elites, as opposed to the ‘ordinary citizen’, it seems more likely that a profit-based colonisation of the off-world represents a chance for deliverance from (rather than resolution to) the ‘terrible dangers’ that will face those left behind on Earth.

6.2 Defending the common heritage of humankind

The paradox of space mining, in a social-ecological sense, is that the Solar System is neither *terra* nor *nullius*. The enclosure of the (presumably abiotic) space commons may not provoke a political animus comparable to the environmental politics of Earth. Yet, as we have discussed (Chapters 3 & 4), the undermining of the *res communis* principles of the *Outer Space Treaty* and *Moon Agreement* are emblematic of the neoliberal obstruction of co-operative action to preserve Earthly commons and egalitarian socioeconomic outcomes. At stake in outer space and on Earth are the rights of future generations to share and benefit from the spaces and resources that should be held in common by the present generation. How can we defend the common heritage of humankind, on Earth and in space? In this section, I revisit Karl Polanyi's *The Great Transformation* (2001 [1944]) and discuss politico-legal counter-movements that offer a social democratic and cosmopolitan alternative to the unilateral private ownership provisions of the CSLCA. I pay particular attention to Joseph Sax's (1969) revitalisation of the ancient Roman public trust doctrine in modern environmental law, as this defence of public or common rights to natural resources presents potential remedies for tragedies of the commons on Earth and in space.

6.2.1 Institutional 'double movements' in response to unilateral space resources law

If we assume that some degree of private and profitable off-world resource appropriation takes place in the future, how might it be directed towards inclusive human futures in space? I will frame this question in terms of the Polanyian 'double movement'. In *The Great Transformation*, Karl Polanyi argued that the essential substance of human society – particularly land and human labour – was transformed into 'fictitious' commodities and made subordinate to the volatility of capitalist markets (2001, ch.6). While Polanyi investigated the extension of market society, he was equally concerned with ways of shielding society from this extension. He argued that modern economic history involved an "extension of the market organization in respect to genuine commodities" but "was accompanied by its restriction in respect to fictitious ones...a network of measures and policies was integrated into powerful institutions designed to check the action of the market relative to labor, land, and money" (2001, p.79). Against the tide of commodification, these 'double movements' had partially

de-commodified and insulated public goods and the essential qualities of human life from market forces (Polanyi 2001, p.79). Neither the movement towards commodification nor this protective countermovement were inevitable. As with fictitious commodification, the countermovement necessarily involved political, legal and cultural institutions intervening to protect human society from the competitive logic of the volatile market.

Polanyi provides numerous examples of the ‘double movements’ that occurred during the ascension of market capitalism, albeit with less attention given to the commodification of land. Counter-movements against the commodification of human beings (in the form of labour markets) included protective measures like trade unions and factory laws that established fair prices and favourable conditions for labour (ibid, p.81). Central banking and management of money supply would provide “a buffer between the internal and external economy”, offering some protection against the shocks that would follow from fluctuations in the price of ‘commodity money’ bound to the international gold standard system (ibid, p.208). Even Tudor and early Stuart monarchs used “the power of the central government to relieve the victims of the transformation” wrought by rapid enclosure and attempted “to canalize the process of change so as to make its course less devastating” (ibid, p.40). *The Great Transformation* was published two decades prior to the cultivation of environmentalism within the Western political consciousness.¹⁰⁷ Nonetheless, Polanyi expressed concern for the protection of “the integrity of the soil and its resources...even the climate of the country which might suffer from the denudation of forests, from erosions and dust bowls” (ibid, p.193). He identified protective movements for nature, like “land laws and agrarian tariffs [that] were called into being by the necessity of protecting natural resources and the culture of the countryside” (ibid, p.138).

What might a double movement look like in outer space? What would it be responding to? The *Outer Space Treaty* (OST) may initially appear as a protective countermovement in the Polanyian sense. However, this Treaty was as much a movement against militarisation and state territorial claims as it was a declaration of universal common rights to use and benefit from outer space. The United States pushed negotiations away from the articulation or suppression of economic rights in space, and subsequently the OST was

¹⁰⁷ His treatment of land and labour as inseparable (2001, p.187) resulted in an understanding of land conservation that prioritised the protection of agricultural workers and their communities rather than an environmental ethics in its own right. He also appears ignorant of the legislative protection for nature in the form of national parks, which had begun with the creation of the Yellowstone National Park in 1872 and was followed by comparable conservation movements in Australia and Europe from the late 1870s onwards.

not “designed to check the actions of the market” (Polanyi 2001, p.79).¹⁰⁸

The *Moon Agreement*, however, is clearly a double movement. UN declarations and multilateral agreements of the 1970s-80s – in particular the highly comparable UN *Convention on the Law of the Sea* – declared that certain global commons were the ‘common heritage of mankind’. The *Moon Agreement* was a reaction against the prevailing unfairness of the global economy and a pre-emptive movement against the potential over-exploitation of the space commons: “Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress” (*Moon Agreement* 1979, Art. 4). It explicitly addressed the question of private resource exploitation in outer space and was part of a broader socialist countermovement against unequal economic development (the New International Economic Order of the UN’s G-77 caucus). Through the limited endorsement of the NIEO and *Moon Agreement* in the most economically advantaged nations, we can see the “back and forth” of the double movement – a pre-emptive de-commodification movement pushed back by a movement seeking to maintain corporate extractive rights (Block and Somers 2014, p.220; see also Peck 2013). Even when successful, de-commodification is neither static nor permanent. The ascension of neoliberal international law (e.g. the ‘Washington consensus’) was itself a countermovement against the initial gains of the NIEO (Bair 2009).

What counter-movements can we see against the CSLCA? Several examples of state-based opposition have appeared in the annual Legal Subcommittee (LSC) meetings of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS). The Russian submission to the 2016 UNCOPUOS LSC offered the most forthright opposition to the CSLCA, asserting that it manifested “a total disrespect for international law order” [sic] and was in keeping with “the notorious doctrine of domination in outer space” (UNCOPUOS

¹⁰⁸ It is also worth noting that there are significantly fewer progressive or leftist civil society groups that have taken an interest in outer space. The Planetary Society, co-founded by Carl Sagan in 1980, stood in contrast to the activism of the L-5 Society and other libertarian or nationalistic space ideologies that emerged during NewSpace’s infancy (Michaud 1986, p.213). While the Society had taken opposition to the militarisation of outer space and the potential placement of nuclear weapons in space, it appears to have not taken a stance on private property rights or international treaty law (in relation to the *Moon Agreement*, for example). Michaud reports that progressive or ‘liberal’ (in the popular American meaning of the term) civil society groups were focused predominantly on anti-nuclearization or anti-militarisation agendas, such as Citizens for Space Demilitarization, and often in response to Reagan’s ‘star wars’ Strategic Defence Initiative (1986, p.233). Shukaitis (2009) also describes the (Marxist) Association of Autonomous Astronauts, which was founded in 1995 in similar opposition to US militarisation of space. The JustSpace Alliance is a new civil society group, which is organising inter-disciplinary events around questions of ethics in space exploration (JustSpace Alliance n.d.).

2016, p.6).¹⁰⁹ Given Russia’s annexation of Crimea two years earlier, it is important to note that this comment is coming from a rival space superpower with a propensity to bypass the ‘binding’ principles of the international legal order when expedient. In the 2017 meeting of the LSC, Belgium (a member state of the European Space Agency) reaffirmed its commitment as a state party to the *Moon Agreement*, while taking aim at the creative interpretations of the OST that have emerged in the wake of the CSLCA (UNCOPUOS 2017, p.3).¹¹⁰ Following a proposal from Belgium and Greece at the 2019 UNCOPUOUS LSC, a working group on space resources law was proposed for the recently cancelled 2020 UNCOPUOUS meeting (UNCOPUOS 2019, p.2).¹¹¹ These examples underscore that the off-world march of neoliberalism is not guaranteed to be a unidirectional process. Yet this opposition to the CSLCA’s terms or its unilateral nature also highlight the limits of the Polanyian double-movement concept, given that his analysis was focused primarily on the emergence of new institutions within the nation state (as opposed to counter-proposals to the CSLCA emerging within existing institutions of international law).

Concerns about the CSLCA are not limited to state practice. Academic institutions have also voiced concern around the CSLCA, such as the Hague Space Resources Governance Working Group (SRGWG). The principles of the *Moon Agreement* have been perpetuated by the SRGWG, particularly the proposal to establish an “international regime...to govern the exploitation of the natural resources of the Moon [and other celestial bodies] as such exploitation is about to become feasible” (*Moon Agreement* 1979, Art.11 at 5). Such a regime was premature when the *Moon Agreement* was opened for signature and it would still be premature in lieu of any actual technologies of commercial space mining. Nonetheless, the Hague SRGWG forum was established in 2016 following the passage of the CSLCA, to be a forum fostering “dialogue and cooperation between governments, industry, international organizations, academia and civil society on the technical and socio-economic aspects of space resources activities” (SRGWG 2019). The SRGWG is primarily a consortium of universities with space law or engineering departments (headquartered at the International Institute of Air and Space Law at Leiden University, The Hague). The SRGWG has also sought stakeholder input: space miners Deep Space Industries and iSpace (Japan) are among the SRGWG’s sponsors. The SRGWG’s ‘Building Blocks’ are offered as potential

¹⁰⁹ U.N. Document: A/AC.105/C.1/2016/CRP.15

¹¹⁰ U.N. Document: A/AC.105/C.2/2017 /CRP.19

¹¹¹ U.N. Document: A/AC.105/C.2/L.311

best practice guidelines for future discussions or soft law agreements, and The Hague group received a positive reception from state delegations in the most recent UNCOPUOUS LSC meeting (The Hague International Space Resources Governance Working Group 2018; UNCOPUOS 2019, pp.33-35).¹¹²

The SRWG are generally focused on preventing unilateralism in space resources law. The group is currently in the process of developing ‘draft building blocks’ that could either lead to a new international space resources agreement, or a refinement of existing international space law in order to resolve ambiguities in relation to space mining. The codification of ‘benefits’ to all countries has been a focus of the SRWG. According to one of the ‘building blocks’:

“Benefits may include, but not be limited to enabling, facilitating, promoting and fostering:

- a) Development of space science and technology and of its applications;
- b) Development of relevant and appropriate capabilities in interested States;
- c) Cooperation and contribution in education and training;
- d) Access to and exchange of information;
- e) Incentivization of joint ventures;
- f) Exchange of expertise and technology among States on a mutually acceptable basis;
- g) Establishment of an international fund.” (SRWG 2017 at 12.1)

The ‘building blocks’ of the SRWG also suggest that an international regime “should enable the unrestricted search for space resources” and “ensure that resource rights over raw materials and volatile materials extracted from space resources...can lawfully be acquired” (SRGWG 2017, at 6.1 & 7.1). The input of commercial space mining interests into the SRGWG forum may be apparent: the ‘benefits’ to all humankind in the building blocks have specified that “The international framework should not require compulsory monetary benefit-sharing” (ibid, at 12.2).

The SRWG draft building blocks could be considered an attempt at compromise between elite mining firms and the rest of the world. The Working Group’s work (and that of the UNCOPUOS deliberations) appear to be valuable first steps towards a social democratic

¹¹² U.N. Document: A/AC.105/1203

compromise on multilateral grounds, a process that might address the US-first ethos of the CSLCA, while offering a ‘third way’ alternative to the socialist-capitalist political binary that often animates NewSpace. Block and Somers note that Polanyi “believed that it is possible to transcend the painful back and forth of the double movement by durably subordinating the economy to social life” (2014, p.220). Polanyi’s democratic socialism was predicated on class compromise and was published in the wake of the Swedish social democratic movement of the 1930s (Block and Somers 2014, p.221). The provision of general welfare and an economic basis for individuals’ freedom of self-determination need not come at the price of innovation or profitability. Constraints on commodification and resource appropriation do not necessarily engender the yoke of communist totalitarianism.

Outside the SRWG, academics have offered promising policy recommendations for achieving such a balance between developed world elitism and a desire to ameliorate global inequality. For instance, Freeland notes that the *Moon Agreement*’s use of the term ‘equitable’ does not necessarily “mean equal, and therefore does not envisage a totally one-sided approach solely for the benefit of developing countries” (Freeland 2017). Baslar (1998) argues that unless private entities exploit off-world mineral resources, *no one* will derive benefits from off-world resources – given that governments appear disinterested in conducting publicly-owned mining operations in outer space. He thus suggests a modest 2-3% resource profit tax on off-world mining, payable to some international authority (1998, p.190). This proposal would represent a globalised version of resource policy from the age of ‘royal metals’, in which the authority to mine was delegated to joint-stock companies in exchange for royalties payable to state parties uninterested in exploiting the resources themselves (Nef 1964; Walker & Johnson 2018, p.60). The ‘international fund’ might resemble a sovereign wealth fund that collected resource rents and distributed them to non-spacefaring countries (as I discussed in section 3.2.2; see also Levine 2015).

The CSLCA is a unilateral private property regime with limited constraints imposed on miners’ actions, with no obligations imposed to pay taxes or rents – it is inadequate for delivering benefits outside of the US space industry. Fabio Tronchetti has argued that private space mining would be legal but only if it adheres to the general principles in the OST – this exploitation must take place for the benefit of all nations (2009, p.235; see also IISL 2016). This point was also expressed by delegates in the 2019 UNCOPUOS LSC meeting (UNCOPUOS 2019, pp.257-8). Tronchetti proposes a regime that merges the provisions of the *Moon Agreement*, Part XI of the *Law of the Sea Convention* (UNCLOS III) and the

International Telecommunications Union conventions for geostationary orbit (2009, p.241). Mining licenses would be granted by a democratically elected ‘International Space Authority’ (2009, pp.246-252). Tronchetti proposes that this “legal regime should not contain any mandatory mechanism obliging States or private operators to share the benefits derived from their exploitative activities” (2009, p.282). He grounds this opinion in the *realpolitik* of the *Moon Agreement* ‘defeat’ and considers that the success of any international regime will be dependent on the participation of powerful developed states (ibid, p.282). Tronchetti concludes by offering more limited policy recommendations for ensuring that off-world resource exploitation proceeded with some commitment to equitability.¹¹³

Is this a reasonable compromise? My view is that, as per Baslar (1998, p.190), a global fund that collected and re-distributed revenue from a ‘space mining super profit tax’ would be preferable to the more limited benefit mechanisms proposed by Tronchetti, pragmatic in the face of ‘strong state’ power his recommendations may be. Such a fund could be used for developing countries to purchase cargo space on rocket launches – for scientific experiments or remote sensing satellites, for instance – in keeping with the OST’s principle that all states should have access to space on a non-discriminatory basis (OST 1967, Art.1). Any re-distributed resource revenue could also be used for domestic social, economic or environmental outcomes, such as mitigating or adapting to the effects of climate change. Or it could be used for novel purposes, like the global ‘universal basic income’ proposed by Levine (2015). A fund such as this could act as reparative intergenerational justice: a form of economic compensation for the unjust and often violent exploitation of mineral commonwealths in the past and as a broader acknowledgement of the injustices of Earthly colonialisms and neo-colonialisms (often perpetuated by Western nations that are now in a position to lead the exploration and use of outer space). This would be in keeping with Dickens and Ormrod’s suggestion that:

“...rather than being founded on the interests of capital, and individualist fantasies, the humanization of outer space could emphasise collective responsibilities on Earth and try to ensure that any gains made through space exploration were spread throughout to improve the

¹¹³ Tronchetti’s (2009, p.283) proposals include the requirement that prospective mining licensees submit proposals to the ‘International Space Authority’ as to how international participation can be promoted through their mineral exploitation (reflecting the governance mechanisms of the International Seabed Authority, which has accepted mining proposals that involved partnerships between developing nations and deep-sea mining firms). He suggests a mining fee be collected by the Authority, and this fee could be increased or reduced depending on the degree of involvement of developing nations (Tronchetti 2009, p.283)

lot of the dispossessed on Earth (as was the original aim of the United Nations Moon Agreement)” (2007, p.190).

Such a fund might be idealistic, but it is less utopian (in the pejorative sense) than NewSpace’s trickle-down benefits engendered by mass migration and industrialisation to the off-world.

However, the terrestrial history of mineral sovereignty tells us that even modest constraints imposed on private space mining interests may be undermined through the capture of democratic institutions. Private mining firms that have drawn on the political infrastructure of the neoliberal network have proven adept at hindering policies and governments that protect common interests in common spaces, from counter-movements against the nationalisation of mining operations to concerted lobbying efforts against international agreements that seek to impose limits on atmospheric carbon emissions. The US rejection of the *Moon Agreement* is consistent with neoliberal resistance to protective ‘double movements’ in a host of policy arenas, ranging from the creation of ecological conservation zones and provision of free healthcare, to increasing minimum wages or funding for public education. When the interests of mining capital are supported by and even embedded within political institutions (as in the case of ‘revolving doors’ between industry and public office), a concerted effort will need to be made in domestic and international institutions to push international space law towards anything resembling the ambitions of the *Moon Agreement*. Given the emergent connections between NewSpace and the Atlas Network, any double movement towards the preservation of intergenerational rights in the space commons would likely meet well-funded and well-organised resistance.

6.2.2 *The public trust doctrine and the stewardship of global commons*

Given the sheer inaccessibility of outer space and its inability to support life, it is largely irrelevant to the “substance of society” – to use Polanyi’s phrase (2001, p.75). If we consider the implausibility of the O’Neillian colonisation project and the numerous challenges in establishing profitable mining operations on celestial bodies, the realisation of neoliberal mineral sovereignty on the space frontier is far from certain. Political animus may be lacking from any ‘double movements’ that attempt to intervene in the marketisation of the cosmos. We are left with a simple question: why does it matter if the space commons are enclosed by the US state in favour of corporate interests?

NewSpace techno-fixes offer the pleasant delusion that space colonisation could address contemporary crises of the global commons. NewSpace has linked the space frontier with the fate of the Earthly ecology – I will do the same. However, I will argue here that preserving global commons on Earth *and* in space requires a legal countermovement against neoliberal constitutionalism (as opposed to its extension) that is predicated on the fortification of intergenerational common and public property rights (as opposed to the further entrenchment of private mining rights in national law). The ‘common heritage of mankind’ principle bears similarities to the stewardship ethos of the public trust doctrine (Baslar 1998). If celestial bodies and terrestrial global commons were treated as public trusts, they could be preserved for the inheritance of future generations. There is an enormity to this task, given the grounding of off-world mineral rights in the sovereignty of the United States, the possibility that this unilateral move will be emulated by other states committed to preserving the neoliberal international legal order (as has already happened with Luxembourg), and the fact that these legislative moves are of a piece with the ‘rogue state’ recalcitrance that has deepened the political impasse on climate change. Yet, contra NewSpace and neoliberal environmentalism, establishing global public trusts for global commons is a goal that is at least grounded in established ‘technologies’ of environmental law.

How do we resist neoliberal constitutionalism – can state sovereignty be used to protect common interests rather than diminish them? Treating outer space as a global public trust is an intriguing possibility, and legal scholar Kemal Baslar (1998) has previously linked the common heritage principle of the *Moon Agreement* with the public trust project of environmental lawyer Joseph Sax (1969). Sax extended legal understanding of the public trust doctrine from the original ancient Roman focus on tidelands and floodplains. He

explored US case law that effectively used this principle in relation to any public lands in which some public institution (federal government, environmental protection agencies and so on) is obligated to act as a trustee. Public trust law involves a public's legal right to natural resources and creates a "judicially enforceable right which restrains government activities" such that commons "must be held available for the general public" (Sax 1969, p.477). A state's failure to protect ecosystems and natural resources as public property represents an abrogation of the responsibility of trusteeship (ibid, p. 488-489). This would open states and public agencies to litigation.

Baslar makes the argument that the 'common heritage of mankind' principle is essentially a natural law concept (1998, ch.1). Legal rights to use public trusts are fundamental, self-evident rights of humans, and belong to the class of civil, political and solidarity rights that emerged from modernity and the post-WW2 climate of international co-operation (Baslar 1998, p.12). Baslar points to other UN declarations of international environmental solidarity, such as the 1972 *Declaration of the UN Conference on the Human Environment* (Stockholm) and the 1992 agreements arising from the UN Conference on Environment and Development (Rio de Janeiro; e.g. Agenda 21). Rather than being a 'principle', 'concept' or legal term of art, the common heritage of mankind needs to be treated as a human right, protected under global public trusts (Baslar 1998).

The public trust doctrine does not prevent private uses of common property, but rather requires that any private use is publicly justified. Sax points to the example of a highway being built through public wetlands, where potential damage to local ecosystems might be acceptable with at least "*some* public justification" (1969, p.496, emphasis in original). A potential scenario in off-world mining might be the irreversible extraction and use of asteroidal water ice in support of a NASA mission to the outer Solar System or the *in situ* construction of Martian habitats. Non-spacefaring or rival spacefaring member states of the UN might find this usage acceptable so long as it was used to support a scientific mission (rather than a colonisation project) in which research findings were publicly available and resulted in technological innovations that were patented under some form of open source license. A scenario such as this would entail usufructory rights – "an interest that incorporates the needs of others" (Sax 1969, p.485) – rather than private rights of exclusive ownership. As a public trust, humankind's common heritage in outer space could still be used at an individual-level, but only with public approval and not for commercial exchange under a system of distributed decision-making (as is the case in market capitalism).

The public trust doctrine and common heritage principle are valuable because they underline the necessity of intergenerational rights in the governance of global commons. It is plainly inadequate to treat rights to the global commons as belonging to only the present generation of peoples. Heritage implies inheritance and ‘holding in trust’ – a more collective understanding of inheritance than the private philanthropy that funds think-tanks like the Heritage Foundation. If equal rights to freely access and use commons are only bestowed upon those alive today, the present generation’s exercise of those rights will prevent future generations from doing the same. George Monbiot (2019) has recently questioned the UN’s Universal Declaration of Human Rights, asserting that it “is almost meaningless, because there is nothing in the declaration insisting that one generation cannot steal from the next”. Monbiot’s phrasing is hyperbolic, considering the importance of this Declaration to national civil rights movements and domestic social welfare policies (among others), but his comment nonetheless accentuates how human rights need to be framed in environmental or inter-generational terms. The Anthropocene can be defined as an inter-generational project in inter-generational theft, from the destruction of essential life-supporting planetary systems to the appropriation of non-renewable resources, like that proposed for the off-world. Monbiot (2019) offers an additional article to the Universal Declaration of Human Rights: “Every generation shall have an equal right to the enjoyment of natural wealth”. Stewardship and preservation are essential to any commons.

The public-trust doctrine has been deployed as a solution to anthropogenic climate change, opening up the prospect of ‘atmospheric trust litigation’ – legal action against states unwilling to enact meaningful strategies to reduce carbon emissions. Numerous movements have either proposed creating a public trust for the atmosphere or have drawn on public trust precedents in order to charge nation states with a failure to protect inter-generational rights to an atmosphere capable of supporting human and non-human life. Australian academic Robert Costanza has argued that the atmosphere is one of many natural assets that “must be held in trust to serve the public good” and that it should be “every government’s responsibility as a trustee to protect these assets as natural capital, and to maintain them for the public’s use, not give them away or sell them to private parties” (2016, p.466). Costanza is part of the Claim The Sky movement, which has proposed an international Atmospheric Trust that could “collect claims for damages to the atmosphere and invest funds in mitigation, adaptation and compensation” (n.d.). The 2015 Urgenda climate case involved 886 Dutch citizens launching action against the Dutch Government for failing to protect their rights to the atmosphere. The

initial decision in favour of the plaintiffs required the Government to reduce national carbon emissions to 25% of 1990 levels and was recently upheld in the Hague Court of Appeal (Urgenda 2018). In 2015, the *Juliana et al. v. United States, et al.* case was filed by 21 youth climate activists, charging that the US Government's failure to act on climate change represented a failure to protect their constitutional rights to life, liberty and happiness.¹¹⁴ Public trust law has thus been revitalised during the escalation of our planetary climate emergency.

However successful public trust litigation may prove to be on Earth, these cases highlight the challenges in introducing something similar for outer space. Do global *demoi* have inalienable rights to pristine off-world environments? What is the 'state' that would be abrogating responsibility for protecting the space commons – the United Nations? Indeed, who would be the plaintiff in any legal action seeking to enforce the common rights of 'all mankind'?¹¹⁵ In global commons like the oceans and atmosphere, the necessity of the stewardship ethos and intergenerational rights is clear, but in outer space it is less obvious. No living organism on Earth depends on celestial bodies (excluding the Sun and Moon, of course) for their survival. Moreover, the functioning of the public trust doctrine is clearer when the nation state is the unit of analysis – or, indeed, smaller jurisdictional units, such as the body of Massachusetts and Californian law that Sax drew on (1969).

Yet a stewardship ethos in outer space could be vitally important for future generations. At the risk of descending into NewSpace Malthusianism, the global population is projected to reach 9.7 billion people by 2050 (UN 2015). Future societies (if not the present generation) will likely deplete key resources on Earth and may *have* to attempt exploiting off-world resources (assuming a circular economy of efficient resource recycling does not eventuate). Lee (2012) links the space commons with the atmospheric commons by pointing to the potential expansion of the hydrogen economy. Hydrogen fuel cells in cars, for instance, produce electric power using water (rather than fossil fuels) and produce no greenhouse gases. However, hydrogen fuel cells are most commonly dependent on platinum as a catalyst,

¹¹⁴ Some links between the space frontier and neoliberal constitutionalism are evident in the *Juliana* case. Former NASA scientist and climatologist James Hansen represented 'future generations' as a plaintiff in the case. Supreme Court Chief Justice John Roberts was instrumental in the neoliberal constitutionalist verdict in the *Citizens United* case – he also supported the Trump Administration in the *Juliana* case by attempting to delay discovery and trial (Rodrigo 2018).

¹¹⁵ In addition to the androcentric and anthropocentric language of the *Outer Space Treaty* and *Moon Agreement*, Baslar notes that the legal personality of 'humanity' is ambiguous as far as legal standing is concerned (1998, p.70).

and – as space mining firms and Goldman Sachs have identified (Edwards 2017) – platinum is rare on Earth but abundant in outer space. A private property system of resource exploitation would lead to unequal access and risk over-exploitation of any valuable off-world mineral reserve – and, if NewSpace’s more expansive plans eventuated, could be used for *in situ* manufacturing of spacecraft and habitats rather than for the more essential goal of global adoption of zero emissions technologies.

The challenge for achieving justice and equitability in the use of global commons, extra-terrestrial or otherwise, lies in the contrasting enforceability of environmental law and trade or property law. The private property rights of multinational corporations are protected through force, torts law and copious multilateral trade agreements. National governments are committed to economic growth and frequently agree to uphold free trade agreements that ensure the ongoing capital accumulation of multinational corporations, often over common interests or the interests of marginalised social groups.

Environmental law, however, often takes the form of voluntary commitments (both tacitly and explicitly). The Paris Agreement is the latest iteration of the United Nations’ *Framework Convention on Climate Change*: it sets only a general goal of limiting global temperature increases to 1.5-2°C above pre-industrial levels, while allowing each nation to determine its own contributions towards achieving this. For a nation to meet the ‘obligations’ of climate treaties, they might decide to use disingenuous carbon accounting measures (such as ‘carry-over carbon credits’) or other ineffective decarbonisation policies (such as seed investments for techno-fixes like ‘clean coal’ or carbon capture technologies that attempt to ‘scrub’ the atmosphere clean). This contrasts markedly with free trade agreements containing investor-state dispute settlement clauses, where a foreign multinational can seek damages for the loss of *projected* earnings (as opposed to actual earnings or real private property) against national governments. The institutional basis for off-world mining is still being formulated, but it is plausible that the extractive rights of corporate space miners would be protected with greater robustness than would adherence to ratified treaty commitments declaring that the space commons be used “on a basis of equality” and not be subject to appropriation (OST 1967, Art.1 & Art.2).

Moreover, ‘rogue states’ can simply refuse to ratify these agreements in the first place or withdraw from agreements entirely. This is not a problem unique to international space law. The authority of international treaty law is diminished when powerful state actors choose not to assent to it. The Trump Administration’s 2017 withdrawal from the Paris Agreement is

a prime example – and the Heritage Foundation have claimed credit for this unilateral ‘strong state’ move against laws of the global commons (Heritage Foundation 2017). The problems in enforcing rogue state obligations to the international community via the United Nations highlight the challenges in emphasising treaty law as a solution to crises in the commons. As Nanda and Ris (1976) noted, the appeal of the public trust doctrine is its ability to strengthen existing agreements.

In the sphere of international law, the public trust doctrine paradoxically needs to be grounded in state practice, but it also needs to transcend it. Baslar notes how ‘common heritage of mankind’ declarations used language of the “universal law of nature” in order to “[convey] a departure from a state-centric international legal system to a human-centric law of mankind” (1998, p.22). Yet, as Tronchetti (2009, p.282) alluded to in relation to off-world resource exploitation, Westphalian notions of sovereign immunity and consent-based international law undermine any international agreement that does not offer terms agreeable to powerful nation states and the interest groups pressuring them. China has flaunted the *Law of the Sea Treaty* in its militarised geoengineering of the Spratley Islands. Despite Ukrainian territorial integrity, Russia annexed Crimea and could thereby claim its vast off-shore oil and gas reserves. US governments with neoliberal and neo-imperial foreign policy predilections have repeatedly disavowed both the competing mineral sovereignties of oil-producing nations and international climate law over a 50-year period. Efforts to uphold the rule of law will inevitably confront the Schmittian paradox: exception to the law is the ultimate source of sovereign power (Schmitt 1985 [1922]).

6.3 Conclusion

Comprehensive resolutions to these enduring problems of international law and geopolitics are outside the scope of this dissertation. Schrijver (2016) has described how global commons are ‘laboratories’ for transboundary problem-solving, necessitating innovative governance mechanisms including “hard law (treaties, protocols) and international juridical decisions”. Perhaps the anticipatory commoning of the off-world will produce new politico-legal mechanisms that can be of use on Earth. Perhaps we might find lasting resolutions to crises of the planetary commons that can be emulated in space, if mining celestial bodies ever becomes feasible or necessary.

I have highlighted some legal mechanisms that environmental interest groups have deployed to prevent the degradation of global commons, while also arguing that NewSpace’s ‘planetary conservation through off-world private property’ is not among the more plausible options we have for this goal. Space mining and colonisation is a dangerous fantasy, because it presents a grandiose techno-fix as a feasible solution to the wholesale degradation of Earth’s capacity to support life. Why bother curtailing anthropogenic pollution on Earth if we can just move to another celestial body elsewhere in the Solar System, ‘terraform’ it into a new Eden and then – taking the techno-eschatology further – escape this mortal coil entirely by uploading our consciousness into computers? Ultimately, NewSpace seeks freedom, from biophysical limits to growth and from obligations to the common good. Despite its outward impulses to environmentalism or cosmopolitanism, the NewSpace imaginary is largely escapist.

Epilogue

At the time of writing, NASA's *OSIRIS-REx* spacecraft was travelling through inter-planetary space at about 22km per second, having recently entered orbit around the asteroid 101955 Benu after a two-year journey from Earth. *OSIRIS-REx* (Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer) will spend over a year studying Benu, transmitting data on the asteroid's chemistry and mineralogy. Among other experiments, the spacecraft will attempt to collect a sample of dust and loose rocks from the asteroid's surface. *OSIRIS-REx* may prove to be an early 'proof-of-concept' for space mining in its use of new propulsion, landing and sampling technologies. The principal investigator on the project is Dante Lauretta, who was hired by space mining start-up Planetary Resources as a science advisor (Planetary Resources n.d.-a). NASA hopes that *OSIRIS-Rex* will "provide a greater understanding of both the hazards and resources in near-Earth space" (NASA 2016, p.4). The spacecraft was built by recurring NASA contractor Lockheed-Martin. If it is successful, *OSIRIS-REx* will collect a modest 60g-2kg sample of loose asteroidal minerals at a cost of over \$800 million to the US taxpayer, before completing the long journey home to Earth in 2023 (ibid, p.4).

This is the present-day reality of trying to 'mine' in outer space. For the prospect of 60g of off-world 'top soil', a huge amount of public money and the engineering capability of a 'big aerospace' conglomerate was required. There is no guarantee of success and no possibility of sending a repair crew when it is (currently) 246 million kilometres away from Earth (NASA & University of Arizona 2019). Before a spacecraft can extract (not just collect) minerals from a celestial body, process them into usable metals or fuel, and then use them in a manufacturing or refuelling process, significant technological advancements are needed. Public or private investments rivalling Cold War superpower space budgets will likely be required. Space mining will not take place in the next decade, if not much longer. The O'Neillian dream of large-scale industrialisation and settlement of the Solar System is unlikely to occur this century and might be entirely impossible.

Yet we cannot disregard entirely the prospect of a neoliberal enclosure of the celestial bodies of the Solar System. There are now legal frameworks for the private ownership of space resources: one that is secured and protected by the military-industrial superpower that is the United States of America, and another which has been enacted by Luxembourg, a key node in neoliberal globalisation and off-shore capital flows. Should off-world resource

appropriation take place, legislative instruments exist to guarantee private claims on the space commons. Despite the challenges of space exploration, NewSpace start-ups are now attracting investment from billionaires like Peter Thiel and Jeff Bezos. Luxembourg's *Space Resources Act* represents the first 'copycat' law in the wake of the CSLCA. The United Arab Emirates has expressed interest in developing space property law (Al-Ahbabi 2016). The Asteroid Mining Corporation, an English start-up, is pursuing a "first-come first served" regime of off-world private property rights as part of their proposed 'UK Space Resources Activities Bill' (AMC 2019). Should Russia or China pursue similar laws in support of their (possibly state-owned) corporations' interests in commercial space mining, the link between property and national appropriation would be even more pronounced. The technology for space mining might be in its infancy but, through the development of pre-emptive property rights for space resources, we are witnessing the beginnings of a 'scramble for the off-world'. At present, domestic space resources law presents a serious challenge to the consensus-based governance of the off-world commons and the future prospect of universal benefit from the exploitation of celestial bodies.

In concluding this dissertation, I will continue look to the past and the future. What can precedents in capitalist and colonial history tell us about the cosmic frontier? Is there any hope that the off-world will be a site of freedom, emancipation and socio-political renewal, as promised by NewSpace? Will it even be NewSpace mining firms that appropriate from celestial bodies and colonise the Solar System? Human space futures may involve forms of politics and law, and power and (in)justice, both different and removed from terrestrial political and economic history. At present, however, the anticipatory, neoliberal challenge to the commons of the cosmos is reflecting problems we face on Earth, and thus points us towards some policy and advocacy goals that are far more immediate.

i. *Against ‘space exceptionalism’: space colonisation in historical perspective*

“The aim of all utopias, to a greater or lesser extent, is to eliminate real people. Even if it is not a conscious aim, it is an inevitable result of their good intentions. In a utopia real people cannot exist, for the very obvious reason that real people are what constitute the world that we know, and it is that world that every utopia is designed to replace” (Carey 1999, p.xii).

For many of us, it is tempting to treat outer space as though it offered human civilisations a clean slate – an escape from the worst parts of our history. Members of the NewSpace network have claimed that the colonisation of the Solar System holds much promise for human progress and growth, for political reinvention and experimentation (e.g. O’Neill 1977; Zubrin 1994; ASD 2019, p.3; NSS 2019). The uniqueness of celestial bodies as a site of politics and culture seems to lead to a sense of ‘space exceptionalism’ within NewSpace, a utopian millenarianism in which the unscrupulousness of human behaviours on the frontier can be swept under the rug. There is an inherent assumption that off-world societies would inevitably function better than those on Earth, that exploiting and settling a new frontier would somehow negate the capacity for greed, apathy, corruption and violence that plagues our terrestrial existence – indeed, that real people were actually capable of thriving (not just surviving) outside the protective borders of their home planet. Space law itself reflects this dichotomy between Earthly political discord and aspirational off-world harmony, such that achieving consensus on space resources law has thus far been difficult to achieve.

While the exploitation and settlement of the celestial frontier would represent a new chapter in the history of politics, economics and law, I have argued that exploring historical precedent is more useful if we are to speculate on how human spacefaring futures might transpire. Indeed, in the pre-emptive enclosure of the off-world commons, we can see an intermingling of several phases in the genealogy of international law: the mineral sovereign extending powers of lawful appropriation onto the colonial frontier; multilateral declarations of human solidarity, as embodied in the United Nations; and the extra-parliamentary fortification of corporate rights under neoliberal constitutionalism (Purdy 2014; Schneiderman 2013), in which state power is captured to attack multilateral legal agreements and – in this case – establish a legal order amenable to private resource appropriations on the next colonial frontier. If ‘going in peace for the benefit of all humankind’ is to be more than

an evocative phrasing of cosmopolitan aspiration, we need to appreciate the threat that the CSLCA poses to the prospect of egalitarian and inclusive futures in space.

It is particularly important, then, to look past NewSpace claims that private ownership rights will be inherently beneficial, and to instead consider the elective affinities between NewSpace and neoliberalism (discussed in Chapter 1). While the network is perhaps too diffuse to reduce to a singular ideology, the ideological threads in NewSpace discourse are predominantly on the liberal economic spectrum (Valentine 2012, p.1047-48). Centre-right views highlight the bureaucratic inefficiency of NASA and short-termism of national space policy, while a more pugilistic anarcho-capitalist thread portrays any governmental oversight of space commerce as authoritarian (e.g. *Orphans of Apollo* 2008). However, there is also a very clear neoliberal component within NewSpace discourses of ‘freedom’ (e.g. Tumlinson 2012; ASD 2016), and these goals of economic liberty have been realised in US space policy. There is now a revised role for NASA and the US state, including to support, fund and purchase from space corporations, while lowering national and international legal barriers that stand in their way (e.g. *NASA Act of 1958*, s.102, as amended under the *NASA Authorization Act of 1985*; Presidential Directive on Space Policy 1988; CSLCA 2015, s.51302; Executive Office of the President 2020). The neoliberal “international economic order” (Bandow 1985) has produced a staggering degree of socioeconomic inequality since the revolutions of the Thatcher and Reagan governments. In the US, for example, the top income decile’s share in national income had risen to 45-50% by 2000-2010 (Piketty 2014, p.24). If the colonisation of the Solar System proceeds on neoliberal terms, we should expect that a share in any economic benefits from the off-world will be limited to all but an elite few.

Beyond the ideological and programmatic affinities between NewSpace and neoliberalism and their similar policy goals of commodification and privatisation, my research has found signs of confluence between NewSpace and the Atlas Network. The NewSpace network and the space property law it has lobbied for cannot be reduced to the exclusive work of Atlas neoliberals. For one, there is support for commercialising space exploration from think-tanks outside of the Atlas Network, such as the Center for New American Security (Zimmerman, in Shammas & Holen 2019, p.6). Peck (2013) also emphasises that neoliberalisation is a process that is uneven and incomplete: this much is true

for both NewSpace and NASA.¹¹⁶ While NewSpace civil society and start-up culture is predicated on harnessing the state to provide commercial incentive for space settlement, other organisations interested in space exploration or colonisation may push space policy back towards a Keynesian or social democratic focus. Further sociological research into the broader constellation of ‘space enthusiast’ organisations could explore the contemporary extent of alternative political economic ideologies within the movement to settle outer space. This could identify ‘minority positions’ that contrast with my efforts to tease out linkages with Atlas neoliberalism, while also building on prior research into the prevailing liberal economics that have guided NewSpace in the post-Apollo years of space exploration (Dickens and Ormrod 2007; Parker 2009; Valentine 2012; Shammass and Holen 2019).

That caveat aside, my focus on NewSpace’s links with Atlas neoliberalism helps to avoid treating this contemporary articulation of ‘space enthusiasm’ ideographically, as though recent events in space resources law were a discrete sideshow to the broader political and economic currents that have transformed the political economy of the United States. My research has demonstrated that, through Peter Thiel’s Founders Fund, at least one Atlas member is an investor in space mining start-ups – including Planetary Resources, the firm that spearheaded lobbying for the CSLCA’s passage into US law (Planetary Resources n.d.-a). The voice of the NewSpace lobby has been amplified through the political infrastructure of Atlas think-tanks, in the form of policy advocacy (e.g. Dunstan & Szoka 2017) and the legislative work of Atlas’ political allies on Capitol Hill (e.g. Rohrabacher 2002; Cong. Rec. 2015b, H3517). The pathway to the CSLCA was established through the US’s non-ratification of the *Moon Agreement*, and this defeat was due to the aligned opposition of the Reagan Administration, Heritage Foundation and L-5 Society against the post-NIEO laws of the global commons. An awareness of potential Atlas engagement with future space activity is essential for any researchers, scientists, engineers, activists and civil society groups who are genuinely interested in inclusive human futures in outer space. Atlas funding or support for an off-world policy goal that claims to be in humankind’s interests should be met with

¹¹⁶ While I have highlighted some definitive movements in the neoliberalising of NASA, it is hard to imagine a scenario where American space science and engineering became entirely commodified or privatised under the neoliberal agenda for scientific research, as described by Lave, Mirowski and Randalls (2010). The scientific knowledge gained from planetary science and astronomy, for example, may never become private property in the same, marketable way that knowledge from the life sciences has in the age of corporate biotechnology. Nor would NASA, a public sector institution so deeply embedded in the modern American consciousness, likely be privatised and managed by market forces in the same way as neoliberal policy in carceral, health or energy policy, for example.

profound scepticism.

I have shown that the vision of space colonisation espoused by NewSpace is ultimately for the individual, not the collective (Chapter 2). NewSpace is repeating Locke's natural rights argument, which falsely presumed that everyone has "the opportunity to be part of the appropriation process" – as though different nations, firms and individuals have an equal opportunity to appropriate the mineral resources of space (Pilchman 2015, p.142). Lockean or neoliberal attempts to 'naturalise' market economies falsely demarcate political and economic spheres (Polanyi 2001). This line of argument suits NewSpace's need to demarcate private and national appropriation as per the *Outer Space Treaty*, more than it does their interest in the fate of Earth or humanity. As Polanyi (2001) argued, capitalist markets are supported by democratic institutions – they should thus be directed towards democratic ends.

Yet neoliberalism involves the privatisation of politics itself and a NewSpace mining start-up effectively purchased a law that suited their commercial interests. My research into the passage of the CSCLA demonstrates that – through their lobbying outlays – Planetary Resources captured state power in order to make legislative interventions into the space commons that I believe undermine international law (Chapter 3). In the CSLCA, US state sovereignty undermines international laws of the global commons on behalf of corporate extractivism, a story that resonates with our current impasse over international collective agreement on limiting carbon emissions. In the case of the CSLCA, the recent history of extra-parliamentary mineral sovereignty is being brought to bear on the future of the space commons (Walker & Johnson 2018).

My historicisation of private property rights has also demonstrated that to allocate mining rights on celestial bodies is *to assert sovereignty over them*. I have paid particular attention to how the CSLCA contravenes the OST's 'non-appropriation principle', that celestial bodies or their contents are "not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means" (1967 Art.2). In addition to this, the CSLCA runs afoul of other assertions of collective rights, responsibilities and obligations that are expressed in the commons 'constitution' of the OST (Chapter 4). Establishing a mining site would impinge on global rights to freely access "all areas of celestial bodies" (OST 1967, Art.1). One party's non-renewable use of mineral resources would prevent "use by all States without discrimination of any kind" (OST 1967, Art.1). Profit-based exploitation would take place under the competitive and depletory logic of

market capitalism, entirely incommensurate with the declaration that the use of outer space should occur “for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development” (Art.1).

If the CSLCA is accepted as consistent with the principles and terms of the OST – an acceptance articulated through state practice, multilateral agreement or international legal and diplomatic opinion – it represents a dangerous precedent in international space law. It paves the way for additional countries to emulate the US and eventually establish a form of neoliberal multilateral law that makes delivering ‘benefits to all countries’ and peoples even harder to achieve (Schneidermann 2013). One potential scenario is a private multilateral agreement that includes only the actors capable of space mining. Some writers have argued that private international law and the use of supranational arbitration courts are a valuable next step for space resources law, a project which would circumvent questions of international politico-legal consensus (Salter & Leeson 2014; Hertzfeld, Weeden and Johnson 2016). Narrower multilateralism in this form could potentially insulate space mining from the diplomatic and legal fora of the UN and the democratic chambers of its member states. There are numerous scenarios where demarcating the space economy from Earthly democracy could be problematic. For example, a country might wish to impose resource super profit taxes on publicly funded space mining start-ups, but could instead face legal action for loss of expected profit under an investor-state dispute settlement mechanism.

As with other legal agreements in the neoliberal legal order, my impression is that private space resources law will proceed on US terms. Of course, the institutional, administrative and judicial frameworks that govern off-world mining rights are still evolving. No company or country has successfully extracted extra-terrestrial minerals and we can only speculate on the precise material, economic and politico-legal forms that property in space resources would take. However, for a national government to grant its citizens the right to exploit extra-territorial resources is to claim authority over those resources, extending sovereign powers of lawful appropriation onto the frontier commons (Chapter 5). Should space mining ever eventuate, there is the realistic possibility (consistent with terrestrial resource imperialism) that the claims of American space miners could be protected through American military supremacy, against the claims of rival state or non-state actors (the national space agencies or state-owned corporations of China and Russia, for instance). Rather than fulfilling the libertarian space pirate myth or representing an escape from the violent history of private property, space mining might bear closer resemblance to the age of

European colonialism, where states delegated authority to their commercial vanguards and property was enforced through the force of law *and* threat of violence.

Hypotheses of off-world resource imperialism aside, can we *really* extend the ‘law of the land’ and categories of sovereignty and property onto a frontier devoid of land, in the sense of the grounded, life-supporting ecosystems in which human societies are embedded? Could there ever be a synergy between NewSpace’s desire for political-economic freedoms and the bypassing of ecological constraints? The NewSpace and neoliberal myth of endless economic growth belies the fact that the limits of the human organism will inevitably travel off-world. This is the central problematic for NewSpace and its eschatology of permanent human colonisation of the cosmos (Chapter 6). Technologies of artificial ‘minimal biospheres’ are in their infancy, and recreating life-supporting environments in deep space entails utter technological dependence (Walker & Granjou 2017). Conservative jurist Carl Schmitt had explored the elemental contrasts between land and sea (2015 [1954]). The maritime existence enabled by technologies of seafaring was entirely different to the telluric existence of the home, “the space in which the ship moves is other than the space of the landscape” (2015, p.73). Outer space brings new meaning to his statement that “technology encloses the humans more than it opens new space to them” (ibid, p.80).

ii. In search of new frontiers: the uncertain futures of the space mining industry and techno-utopian democracy

Neoliberalism is predicated on the capture of state sovereignty to create and protect corporate freedoms – whether the freedom to appropriate the minerals of the commonwealth, freedom from environmental protection law or freedom to shift capital to off-shore jurisdictions. These freedoms, while enabled by the state sovereignty often decried by NewSpace and techno-libertarians, represent an escape fantasy: the flight from social democracy and the principle of the common heritage of humankind, and an escape from a dying Earth. If an actual escape from Earth is to materialise, however, it will likely involve a different cast of characters than the start-ups that I have discussed. To an extent, the preceding account represents a brief snapshot in space history: the abrupt rise and (potential) fall of the space mining firm. Reflecting the boom and bust of Silicon Valley start-up culture, the nascent space mining industry appears to be in financial trouble.

With backers like Larry Page and James Cameron, Planetary Resources made a grand entrance into the NewSpace commercial landscape in 2012. In 2015, the company successfully lobbied for the resource ownership provisions of the CSLCA – this may prove to be NewSpace’s biggest political triumph. By 2018, however, Planetary Resources announced some significant setbacks. Interest from “a mining company that was in line to lead a fresh funding round” failed to materialize (Boyle 2018a) and, shortly afterwards, staff layoffs resulted in “the company being down to around 10 employees” (Messier 2018). By August 2018, the firm company began “auctioning off hundreds of items from its headquarters... ranging from industrial-strength CNC machine tools and 3-D printers to laptops and folding chairs” (Boyle 2018b). In October 2018, the company was purchased by Consensusys, a blockchain company owned by Ethereum co-founder Joe Lubin (Planetary Resources 2018). From space mining to cryptocurrency ‘mining’, it is a turn of events highlighting the sheer challenge of industrialising the Solar System.

Deep Space Industries (DSI), too, has been purchased by another space firm. In January 2019, DSI was purchased by the Bradford Space group, a US-owned and European-based space manufacturing firm. As with Planetary Resources’ acquisition, the intellectual property for the new space technologies developed by DSI have been passed onto a larger firm. The technologies might be put towards more modest applications, such as DSI’s propulsion technologies being used in low-Earth orbit (Bradford Space Industries 2019). These corporate acquisitions may represent a shot-in-the-arm for space mining, but it remains to be seen whether the new owners of Planetary Resources and DSI will make any new investments in space mining technology. Maybe Luxembourg’s deep public coffers will make new investments in space mining and continue the financial connection between the off-world and the ‘off-shore’; perhaps the loss of €25 million via Planetary Resources will discourage them from doing so.

The Moon Express brand remains in the space resources landscape – it’s broader business interests in lunar landing technologies provide it with a more immediate revenue stream. The company was recently selected as one of nine companies in NASA’s Commercial Lunar Payload Services contracts program – they will be eligible to bid for contracts to sell lunar delivery services to NASA, as part of a \$2.6 billion pool of public funds available through to 2028 (NASA 2018). iSpace (based in Japan and Luxembourg and funded in part by the Japanese government) appears to be their largest competitor for access to the presently non-existent space resources market.

As far as techno-libertarian movements are concerned, the quest for an ‘escape from politics’ – as Peter Thiel describes it (2009) – will need to look to Earthly frontiers, in the short-term at least. Outer space or cyberspace (as per Singularitarianism) may prove a post-biological fantasy that is eternally out-of-reach. There appears to be a convergence between the settlement of the aquatic frontier and – in a recent development – the medium of cryptocurrency. Patri Friedman of the Atlas-affiliated Seasteading Institute has put forth the case for start-up countries: “permanent autonomous zones on land or at sea intended to accelerate economic development and to serve as laboratories for voluntary political experiments” (Friedman 2018). Cryptocurrency, he argues, will eventually produce “profound political change” by reducing “nation-state revenue (and thus power)” and fostering new technologies of governance, such as ICT-enabled delegative democracy (Friedman 2018). We can see here the persistent dream of the ‘sovereign individual’ – the anarcho-capitalist elite – rising from the ashes of global political-economic upheaval (Davidson & Rees-Mogg 1999).

The CLSCA is a case study in the privatisation of a republic once lead by a ‘government of the people, by the people and for the people’ – yet Friedman is here portraying cryptocurrency as a techno-fix for democracy. In this regard, the new owners of Planetary Resources have made an interest remark; according to Ethereum co-founder Joe Lubin:

“Bringing deep space capabilities into the ConsenSys ecosystem reflects our belief in the potential for Ethereum to help humanity craft new societal rule systems through automated trust and guaranteed execution. And it reflects our belief in democratizing and decentralizing space endeavors to unite our species and unlock untapped human potential” (in Planetary Resources 2018).

Ethereum – as an open source cryptocurrency platform – might herald new ‘societal rules’ of great potential for the increasingly enclosed digital commons. But it would be remiss to treat the decentralisation of currency as being essential to the revitalisation of democracy. If democracy itself is to be further decentralised and arbitrated through technologies of market exchange, the further concentration of corporate power (and further transference of this power into the political sphere) is an equally plausible outcome.

NewSpace discusses democratisation largely in terms of reducing the cost of being a participant in space exploration and settlement (e.g. Beck, cited in Shammas & Holen 2019, p.3; Space Renaissance USA 2020 [2011]). The claim is that through the entrepreneurship of

tech start-ups and the incentive of private property ownership (and the ‘light touch’ of the state apparatus and taxpayers’ purse), space travel and habitation can be transformed into something more efficient, thus more affordable, and thus accessible to a greater number of people. Elon Musk’s Mars colonisation blueprint, for instance, rests upon bringing the cost of travel to the Red Planet down to that of a “median house price in the United States, which is around \$200,000” (Musk 2017, p.47).

“Not everyone would want to go. In fact, probably a relatively small number of people from Earth would want to go, but enough would want to go who could afford it for it to happen. People could also get sponsorship. It gets to the point where almost anyone, if they saved up and this was their goal, could buy a ticket and move to Mars...” (ibid, pp.47-48)

The most publicised plan for pursuing the large-scale settlement of outer space rests upon pioneers who can reach what is (for many) the increasingly out-of-reach goal of outright home ownership.

Yet, future sailors on the cosmic seas may discover alternate political forms that are even more exclusionary and authoritarian, beyond NewSpace ‘democracy’ and neoliberal constitutionalism. Other than a seat on Musk’s Colonial Fleet, what would \$200,000 purchase for his Martian colonisers? Is the fare also the price of admission into the Martian political community, or does that privilege rest with the ‘early adopters’ or those able to pay exorbitant ‘surge pricing’ if a planetary ecological apocalypse starts to materialise? Will Martian-produced food, water, habitation and fuel be distributed to each according to their needs and from each according to their ability? Or are further expenses likely if establishing life-supporting artificial ecosystems prove as costly and unrealisable as they have on Earth? Does the initial expense of accessing this off-world democracy include a return flight? Or will off-world colonies produce new classes of impoverished workers and indentured labourers, sweating in their spacesuits to afford a ticket back home? Will it even produce a new class of robotic labourers, bestowed with forms of artificial intelligence that do not require recognition of fundamental political rights or freedoms? As a potential site of political change and experimentation, we should not assume the off-world will deliver the innovations that we need or want.

iii. Justice, equality and stewardship: the future of the global commons

These speculations about off-world politics rest upon the assumption that space colonisation and mining will actually take place. Even if a legal order of neoliberal mineral sovereignty were enacted on the space frontier, questions about resource exploitation in outer space may not engender the same ethical and political concerns as terrestrial mining or neo-colonialism. Unlike the ‘new world’ on the frontiers of European empire at the dawn of global capitalism, there is no indigenous *nomos* to be displaced through brute force and subjugation. Nor is off-world mining likely to threaten fragile ecologies (if we ignore the possibility of discoveries in exobiology). Future political-economic approaches to NewSpace could further explore the potential social and environmental consequences of space mining, because the egalitarian and intergenerational policy considerations prompted by off-world enclosure may suffer from a lack of political will (outside the legal and diplomatic chambers of the United Nations, at least).

The pristine environments of the Solar System bring into stark relief the scale of enclosure and over-exploitation of environments on Earth. Celestial bodies may represent the ‘final frontier’ for resource appropriation, but they cannot support life as we know it. From the methane lakes and cryo-volcanism of Titan, to the geysers of water vapour extending into space from the south pole of Enceladus, and the sub-surface oceans of Europa – these are dynamic and fascinating environments, but it is likely that most of the off-world commons will be eternally out-of-reach from the processes of accumulation, depletion and pollution that have brought Earth to widespread ecological emergency. Off-world commons are a unique case study in the history of enclosure, but – the discoveries of exoplanetology pending – it is the life-supporting Earth that is unique in the history of the observable universe, or at least in our cosmic neighbourhood. Preserving it is our only feasible option in the age of the Anthropocene.

The oceans are increasingly unable to support marine life. An atmosphere capable of maintaining planetary temperatures at a level that makes Earth habitable for all species is slipping through our fingers. Great swathes of the South American and Australian continents have been set ablaze in recent years. Recent prerogatives of ‘restarting the economy’ look set to return anthropogenic carbon emissions to their pre-pandemic levels. One perverse outcome of planetary temperature increases is that melting sea ice has made gas and oil reserves on the deep seabed more accessible. Several countries and corporations might look to prolong fossil

fuel combustion by exploiting the Arctic Circle – a new mineral commons that can be enclosed and burned to the detriment of global commons of the seas and skies.

While the NewSpace quest for private property rights in space may seem novel, it essentially masks a much bigger problem: that our supposedly democratic institutions appear better equipped to serve private interests at the expense of those things we hold in common on Earth. In section 3.3, I deployed a research methodology that might be of use to activists and scholars seeking to understand and critique the role of neoliberal actors in domestic and international politics. By using a number of public information sources – specifically, Congressional records and lobbying data – I was able to describe the passage of the CSCLA into US public law. In this process, I was indebted to the online tools developed by the Center for Responsive Politics (e.g. CRP 2018a), a civil society organisation advocating for greater transparency in American democracy. Scholars investigating neoliberal influence on local political life might find similar tools in their local jurisdictions that let them identify neoliberal actors involved in similar attacks on democracy and the commons – such as in the ‘citizens’ hub’ of Guardian Media’s *Transparency Project* (Guardian Australia 2019).

It is also worth highlighting the value of a ‘networked’ approach to the study of neoliberalism (Mirowski & Plehwe 2009) and mineral sovereignty (Walker & Johnson 2018, p.64). My research has teased out some new fields of inquiry for sociologists and historians interested in the connection between neoliberal political networks and NewSpace. Further research is needed to uncover additional connections to those I have established; perhaps future projects looking at the cross-pollination of NewSpace and neoliberalism could be augmented with additional forms of data collection. Understanding the broader impact of the neoliberal network in diverse policy arenas can take scholarship and activism beyond a more general critique of the ‘forces of capitalism’, and into an analysis that points to particular nodes and agents of neoliberalism that are directly responsible for the undemocratic or anti-environmental laws we are faced with. Such an approach might underscore the imperatives for particular ‘double movements’ (Polanyi 2001), such as strengthening disclosure laws for campaign contributions or closing specific ‘revolving doors’ between political office and private industry (such as those that undermine protective action in Earth’s commons).

There are doubtless more policy recommendations that could address the depth and breadth of the challenges we face under planetary ecological emergency, but they are largely outside the scope of this dissertation. Establishing global commons as global public trusts may serve as a means to strengthen *existing* agreements that seek to protect them on behalf of

present and future generations (Nanda & Ris 1976). Furthermore, as Dahlin and Fredriksson (2017) have identified, the act of resistance to enclosure and extractivism is itself an act of commoning, or ‘working in common’. Dahlin and Fredriksson describe how “multiple singularities” can establish “arenas where diverse movements can coexist and interact” (2017, p.271; Hardt & Negri 2004). Facing a common enemy in the global commons, a diverse array of interest groups might be able to discover further “common ground for interaction and collaboration that can encompass large differences between the collaborating actors” (2017, p.271).

Despite the enormity of these challenges, building political coalitions that are predicated on collective rights and responsibilities offers a more promising and inclusive utopia than the NewSpace project of off-world environmentalism and trickle-down democracy. In closing, I will turn to Cynthia Selin’s description of the ‘sociology of the future’, how “stories of the future are potent sources of legitimization, inspiration and construction” (2008, p.1880). Contrary to the rising tide of youth climate action, NewSpace is telling a story that there is in fact a ‘Planet B’, and claim that a highly speculative and market-based project is a means of reaching it. This fantasy is now grounded in the sovereign authority of the world’s reigning space superpower and is supported by one of the world’s wealthiest tax havens. For NewSpace and neoliberalism, outer space represents a frontier of guilt-free expansion and a means of avoiding the curtailment of economic growth and personal freedoms on Earth. However, these eschatological and environmentalist justifications for space mining are grounded in a faulty sense of inevitability.

What might be an alternate story for us to tell about the future, something more pragmatic than the fantasies of NewSpace or less foreboding that the ongoing fortification of neoliberal constitutionalism? Can we arrive at a new *nomos* of the Earth and off-Earth that is instead predicated on the global and intergenerational solidarity rights and stewardship ethos envisioned under the common heritage principle? In the wake of the Global Financial Crisis and the Great Depression before it, neoliberal actors recognised the importance of never letting ‘a serious crisis go to waste’ (Mirowski 2013). As planetary ecological collapse looms large on the immediate temporal horizon, we might now strengthen democratic and cosmopolitan ideals in our politico-legal institutions, with an even greater sense of urgency and a greater commitment to the things we need to hold in common.

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