



UvA-DARE (Digital Academic Repository)

The terrestrial trap: International Relations beyond Earth

van Wingerden, E.; Vigneswaran, D.

DOI

[10.1017/S0260210524000184](https://doi.org/10.1017/S0260210524000184)

Publication date

2024

Document Version

Final published version

Published in

Review of International Studies

License

CC BY

[Link to publication](#)

Citation for published version (APA):

van Wingerden, E., & Vigneswaran, D. (2024). The terrestrial trap: International Relations beyond Earth. *Review of International Studies*, 50(3), 600-618.
<https://doi.org/10.1017/S0260210524000184>

General rights



It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

SPECIAL ISSUE ARTICLE

The terrestrial trap: International Relations beyond Earth

Enrike van Wingerden  and Darshan Vigneswaran 

Department of Political Science, University of Amsterdam, Amsterdam, Netherlands

Corresponding author: Enrike van Wingerden; Email: e.vanwingerden2@uva.nl

(Received 28 April 2023; revised 16 January 2024; accepted 17 January 2024)

Abstract

Human capacity to explore and shape outer space will increase substantially over the next 50 years. Yet, International Relations (IR) theory still treats outer space as an isolated, unique, or inconsequential realm of political life. This paper moves IR beyond its 'terrestrial trap' by theorising planetary politics as inherently embedded in relations with environments and actors that are located beyond Earth. To face the momentous and often alarming political developments taking place in outer space, from space militarisation to space colonisation, we challenge two of IR's terrestrial biases. First, we confront the assumption that developments in international relations take place only or primarily on Earth. We show how the historically constituted ideologies and political economies of colonisation and domination are extended to – but also transformed within – outer space exploration and settlement. Second, we challenge the notion that developments in outer space form a logical extension of politics as it has emerged on the habitable surface of our planet. We move beyond zones of human habitation and explore how the material conditions of space intersect with situated histories of political governance and control. By analysing politics beyond Earth, we retool IR theory to confront an extraterrestrial political future.

Keywords: anti-colonialism; domination; materiality; non-human; outer space; planetary politics

Introduction

What does it mean to think and theorise from the grounds of planet Earth? This question emerges at a moment when our field of study is thinking about politics on a planetary scale.¹ The planetary, often contrasted with the international or the global, challenges a narrow conception of politics as limited to relations between humans and their states.² Beyond these familiar actors, more-than-human beings and processes, such as global warming, permafrost melting, and sea-level rise, might also be taken as integral elements of the planetary sphere of politics, especially in the context of anthropogenic climate change.³ In light of these debates, some scholars have come to recognise that

¹Anthony Burke, Stefanie Fishel, Audra Mitchell, Simon Dalby, and Daniel J. Levine, 'Planet politics: A manifesto from the end of I', *Millennium: Journal of International Studies*, 44:3 (2016), pp. 499–523; Philip R. Conway, 'On the way to planet politics: From disciplinary demise to cosmopolitical coordination', *International Relations*, 34:2 (2020), pp. 157–79; Jairus Victor Grove, *Savage Ecology: War and Geopolitics at the End of the World* (Durham, NC: Duke University Press, 2019); Delf Rothe, 'Governing the end times? Planet politics and the secular eschatology of the Anthropocene', *Millennium: Journal of International Studies*, 48:2 (2020), pp. 143–64.

²Milja Kurki, *International Relations in a Relational Universe* (Oxford: Oxford University Press, 2020), p. 168.

³Dipesh Chakrabarty, *The Climate of History in a Planetary Age* (Chicago: University of Chicago Press, 2021); William E. Connolly, *Facing the Planetary: Entangled Humanism and the Politics of Swarming* (Durham, NC: Duke University Press, 2017).

planetary politics does not end at the edge of the Earth's atmosphere.⁴ Indeed, further out in space, phenomena such as satellite surveillance systems, space debris, and exploitable space resources also have a politics. This politics is deeply connected to, yet goes beyond, the conventional realm of Earthly political relations.⁵

To theorise political phenomena in outer space, we argue that the discipline of International Relations (IR) needs to rethink two related 'terrestrial' assumptions.⁶ IR theory commonly assumes that politics (a) occurs on the Earth's surface and (b) takes place within conditions that are suitable for human flourishing. Yet many of the conceptual frameworks that theorists have developed from these terrestrial assumptions are running up against their limits, particularly in studying the momentous and often alarming political developments taking place in outer space, from space militarisation to plans for celestial colonisation. Challenging IR's terrestrial assumptions makes it possible to interrogate how political phenomena in outer space are connected to Earthly politics, including, importantly, to prevailing forms of domination. At the same time, doing so allows us to identify where understandings of politics based on terrestrial concepts, theories, and histories may fail, as the politics of outer space are more than a mirror image of politics on Earth. In this dual way, rethinking our terrestrial assumptions allows us to approach familiar political questions in new ways, while provoking altogether new questions about politics.

In this article, we make the claim that our capacity to think about outer space is constrained by a 'terrestrial trap'. Just as John Agnew disputed the territorial state as the 'container' of society, so do we seek to denaturalise the rootedness of politics within Earthly vantage points and conditions.⁷ Similar to Agnew's *territorial trap*, we argue that this *terrestrial trap* is a spatial ideal that has been politically and theoretically reified. Like the borders between nation-states, the precise boundary between Earth and outer space is a product of human ideas that is made real through concrete practices. The drawing of the Kármán line at an altitude of 100 kilometres, often considered the point where the Earth's atmosphere ends and outer space begins, is in many ways as arbitrary as national borders and has always been subject to scientific and political contestation.⁸ Challenging the terrestrial trap allows us to understand how the established separation of Earth and outer space shapes and limits our understanding of politics.

There are also clear differences between Agnew's 'territorial trap' and our 'terrestrial trap'. Despite the constructed nature of the precise boundary, being in outer space is markedly different from being on Earth. While the spatial trap of modern territoriality in Agnew's conception can be escaped, at least in theory, the terrestrial trap is deeply rooted in the material conditions of Earthly existence and, at least for us Earthly critters, cannot be easily avoided or escaped. Therefore, part of challenging the terrestrial trap is comprehending how these material processes intersect with situated histories of political governance and control. Our point is, therefore, not to completely denounce terrestrial modes of thinking, but to alert us to how they may hold us back from grappling with important and rapidly evolving political phenomena in outer space.

⁴Valerie Olson and Lisa Messeri, 'Beyond the Anthropocene: Un-earthing an epoch', *Environment and Society*, 6:1 (2015), pp. 28–47; Columba Peoples and Tim Stevens, 'At the outer limits of the international: Orbital infrastructures and the technopolitics of planetary (in)security', *European Journal of International Security*, 5:3 (2020), pp. 294–314.

⁵Raymond Duvall and Jonathan Havercroft, 'Taking sovereignty out of this world: Space weapons and empire of the future', *Review of International Studies*, 34:4 (2008), pp. 755–75; Delf Rothe, 'Seeing like a satellite: Remote sensing and the ontological politics of environmental security', *Security Dialogue*, 48:4 (2017), pp. 334–53; George Sariak, 'Between a rocket and a hard place: Military space technology and stability in international relations', *Astropolitics*, 15:1 (2017), pp. 51–64; Edythe Weeks, *Outer Space Development, International Relations and Space Law: A Method for Elucidating Seeds* (Newcastle upon Tyne: Cambridge Scholars Publishing, 2013).

⁶We use 'terrestrial' in the meaning of 'Earthly'. While this is a common interpretation of the term in IR theory, specifically within debates on planetary politics, it slightly differs from its meaning as 'land-based', as used by scholars of maritime or oceanic politics.

⁷John Agnew, 'The territorial trap: The geographical assumptions of International Relations theory', *Review of International Political Economy*, 1:1 (1994), pp. 53–80.

⁸Jason Beery, 'Unearthing global natures: Outer space and scalar politics', *Political Geography*, 55 (2016), pp. 92–101; M. J. Peterson, *International Regimes for the Final Frontier* (Albany: State University of New York Press, 2005), p. 61.

The terrestrial trap, as we define it, consists of two Earth-based assumptions about politics that profoundly shape the way in which International Relations practitioners and theorists operate. These assumptions, we argue, inhibit our ability to understand outer space as an increasingly pivotal realm of political life. We call the first assumption ‘flat-Earthism’. This is the assumption that most or all politics takes place on the surface of the Earth as simplified through a projection of that surface onto a two-dimensional map. Flat-Earthism, which has been a foundational element of territorial sovereignty (and many other geopolitical principles: core/periphery, regionalism, and Global North/Global South), simply cannot generate a meaningful system for the spatial division of outer space into its constituent elements and tends to privilege surface-level events and dynamics in its understanding of what counts as ‘political’.

The second terrestrial assumption is ‘human habitationism’. Human habitationism posits that developments in outer space form a repetition or extension of politics as it has emerged on the habitable surface of the Earth. While human politics on Earth has developed in specific material circumstances, including 9.8 m/s² gravity, oxygen-rich air, moderate temperatures, and atmospheric pressure, the assumption is that politics works the same way regardless of these circumstances. This makes it difficult to comprehend how politics needs to be adapted to different gravitational forces, atmospheric compositions, or environmental conditions in outer space.

These two terrestrial assumptions play a vital role in the formulation of our knowledge about the political, helping to simplify empirical reality to make it more amenable to theorisation and analysis. We argue, however, that certain lines of inquiry in contemporary IR demand that we challenge these terrestrial assumptions. More specifically, using the examples of anti-colonial and materialist thought, we posit that challenging these assumptions allows us to face how new forms of domination are being constituted and made legitimate through human activities in outer space. We also contend that denaturalising these assumptions opens our eyes to the new and urgent political questions that emerge within outer space as a radically different material environment. While we limit ourselves to a *theoretical* contribution in this article, we show that this engagement also allows us to shine a different light on concrete empirical problems in outer space.

Challenging these terrestrial assumptions, in our view, is paramount for certain lines of inquiry, but not necessarily for others. Indeed, terrestrial thinking remains crucially important to address the environmental and socio-political crises of our time. For planetary thinkers in and beyond IR, the terrestrial is often invoked to extend the political to all ‘terrestrials’, that is, all Earthly organisms that reside in the so-called Critical Zone.⁹ To Bruno Latour specifically, ‘the Terrestrial’ also emerged as a necessary new kind of political orientation in the face of climate catastrophe, one that reconciles ‘attaching oneself to a particular patch of soil [and] having access to the global world’.¹⁰ In shifting our theoretical point of view, our efforts do not seek to displace these terrestrial struggles, but to make visible how they are deepened and transformed in outer space. By identifying and questioning the terrestrial trap, we attempt to lay the theoretical groundwork for IR theory to ‘confront the cosmos’.¹¹

This article proceeds in three parts. The first section asks why IR theorists often do not ‘look up’ to outer space. We begin by listing the common fallacies about space and its relative unimportance and challenge these fallacies to make the case for meaningful inclusion of outer space as an object of political analysis. The second section explores the first terrestrial assumption, ‘flat-Earthism’, focusing primarily on moving beyond a flat-Earthist ontology and its colonial manifestations. Using the example of anti-colonial IR theory, this section shows that efforts to access and use space are producing new axes of both colonial domination and contestation, which only become visible when

⁹Regan Burles, ‘Another geopolitics? International Relations and the boundaries of world order’, *International Studies Review*, 23:4 (2021), pp. 2108–23; Conway, ‘On the way to planet politics’.

¹⁰Bruno Latour, *Down to Earth: Politics in the New Climatic Regime* (Cambridge: Polity Press, 2018), p. 24.

¹¹Audra Mitchell, ‘Can International Relations confront the cosmos?’, in Jenny Edkins (ed.), *Routledge Handbook of Critical International Relations* (London: Routledge, 2019), pp. 51–64.

we first provincialise terrestrial histories and assumptions. The third section discusses the problems with the second terrestrial assumption of 'human habitationism' through an engagement with materialist thinking. This discussion demonstrates that space politics beyond zones of human habitation is more than an extension of terrestrial politics, as it is shaped through the intersection of the specific material conditions and situated histories of political control. The conclusion summarises the argument and suggests paths forward for studying outer space as a deeply significant realm of political life.

Why IR theorists have not 'looked up'

To make sense of political developments in the coming 50 years, IR theory would benefit from a reorientation towards *planetary* politics as constituted by the relations between the Earth and outer space. Before we move on to make this case, it is vital that we directly address the sceptics in our audience, and specifically those who may be inclined to see outer space politics as a minor, epiphenomenal, or speculative concern when compared to the core issues of IR. We therefore begin by identifying the grounds to believe that space might not be so relevant to IR theorists, discussing three common fallacies.

Fallacy 1: Space is small

IR research retains limited space on its agenda for outer space. Previous scholarship has noted that outer space 'has been largely removed, marginalized and silenced' in theorisations of international relations.¹² Indeed, when IR scholars define and theorise 'space', they usually interpret it exclusively in Earthly terms.¹³ We believe that one reason for this is a limited awareness of the sheer amount and importance of activity beyond the Earth's atmosphere, combined with a sense that any issues occurring in outer space must be tangential to larger matters of political conflict and/or economic competition. As such, while studies of space politics have been increasing in recent decades, these studies are often designated as a separate branch of research (e.g. 'astropolitics'), and have yet to claim a place in the core of our disciplinary knowledge.¹⁴

This is bound to change, as outer space activities constitute a large, important, and growing facet of international political interactions. The most obvious dimension of this claim is that there are over 5,000 active satellites currently in Earth's orbit. These satellites play essential roles in the operation of global security, communications, and research systems and are maintained through sprawling networks of launch sites, research and development facilities, and government regulatory bodies. The 15,000 companies currently participating or investing in the space industry earn revenues of \$US400 billion every year. This is projected to grow to \$US1 trillion by 2040.¹⁵ Over 100 states have their own space programmes to regulate the industry, conduct research and development, and pursue exploration goals. After decades of telescopic investigation and exploratory robotic probes across the solar system, space agencies are moving back towards crewed missions with the goal of establishing a sustained presence on celestial bodies, including the Moon and Mars, in the coming decades.¹⁶ Due to the size and importance of these endeavours, outer

¹²Natalie Bormann and Michael Sheehan (eds), *Securing Outer Space: International Relations Theory and the Politics of Space* (London: Routledge, 2009), p. 4.

¹³E.g. Harvey Starr, *On Geopolitics: Space, Place, and International Relations* (London: Routledge, 2015); Jeppe Strandsbjerg, *Territory, Globalization and International Relations: The Cartographic Reality of Space* (Basingstoke: Palgrave Macmillan, 2010).

¹⁴Recent studies of outer space politics situated within International Relations, broadly defined, are discussed in Dimitrios Stroiikos, 'International Relations and outer space', in *Oxford Research Encyclopedia of International Studies* (2022), available at: <https://oxfordre.com/internationalstudies/display/10.1093/acrefore/9780190846626.001.0001/acrefore-9780190846626-e-699>.

¹⁵Morgan Stanley, 'Investing in the final frontier', available at: <https://www.morganstanley.com/ideas/investing-in-space>.

¹⁶CNSA, 'Joint statement between CNSA And ROSCOSMOS regarding cooperation for the construction of the International Lunar Research Station', available at: <http://www.cnsa.gov.cn/english/n6465652/n6465653/c6811967/content.html>; NASA, 'Artemis', available at: <https://www.nasa.gov/specials/artemis/>.

space constitutes a key component of efforts to address the fundamental questions of our discipline, including how governments and companies compete for resources, how we organise our economies, how we protect our environment, and how we seek to maintain security.

Fallacy 2: Space is irrelevant to Earthly politics

These developments in outer space are often seen as separate from international politics, despite the palpable evidence of its current importance to life on Earth. In part this has to do with an ingrained tendency, beyond a series of platitudes about the ‘space race’, or the dramatic effect of views of Earth from space, to see outer space as somehow disconnected from the political concerns of everyday or ordinary people. Indeed, as Audra Mitchell has argued, IR theory has a hard time facing developments in outer space due to a failure to see the connections between its usual subject-matter and ‘the cosmological conditions in which it is embedded’.¹⁷ Outer space development technologies tend to be regarded as ‘out there’, rather than as intimately connected to the Earthly socio-political contexts and infrastructures upon which they depend.

In this respect, we find it helpful to acknowledge that workers in Nationalist Socialist camps were responsible for assembling the world’s first rockets. For us, this observation brings home the fact that our endeavours in outer space have always been deeply wedded to structures of power and inequalities on Earth. Similarly, technologies of outer space exploration have always been deeply entangled with colonising projects. Launch technologies require equatorial spaces away from population centres, while space observation facilities demand remote locations without light pollution or radio interference. Procuring access to or ownership of equatorial and remote areas nearly always requires dealing with colonised lands and populations, such as in Algeria, Australia, Brazil, French Guiana, and Hawai’i.¹⁸ In the most recent connection between Earthly politics and outer space technology, Elon Musk’s decision to donate and then withdraw his Starlink satellite communications’ infrastructure impacted Ukrainian soldiers’ capability to resist the Russian invasion. The wide array of intimate connections between outer space and Earthly politics makes it difficult to have a critical perspective on politics that excludes outer space from the picture.

Fallacy 3: Space research is speculative/outlandish/unserious (it’s for tech bros/geeks)

A final reason why outer space has often been overlooked within IR theory has to do with the futuristic ideology that infuses the political discourse of many advocates for the space industry. As Daniel Deudney has written: ‘Nowhere does the interplay between imagination and foresight loom larger than in space, where imaginary visions and technological forecasts and assessments play foundational roles.’¹⁹ Put simply, IR – and other social sciences – tend to be neglectful of outer space because of a suspicion of ‘space cadets’. From Jeff Bezos’s vision of moving heavy industry off Earth to Elon Musk’s plans to make human beings a multi-planetary species, the plans of high-profile space cadets are regarded with dismay, especially in a time of deepening planetary crisis.²⁰ By extension, the futuristic zeal of advocates for projects like asteroid mining or Mars colonisation has garnered a form of stigma for space research, as somehow ‘unserious’, ‘speculative’, or even ‘outlandish’, especially when compared to research that busies itself with ‘bread and butter’ IR topics such as famines, wars, pandemics, recessions, and mass migrations.

¹⁷ Mitchell, ‘Can International Relations confront the cosmos?’, p. 61.

¹⁸ Alice Gorman, ‘The cultural landscape of interplanetary space’, *Journal of Social Archaeology*, 5:1 (2005), pp. 85–107; Alice Gorman, ‘The archaeology of space exploration’, *The Sociological Review*, 57:1 (2009), pp. 132–45; David Uahikeaikale’ohu Maile, ‘On being late: Cruising Mauna Kea and unsettling technoscientific conquest in Hawai’i’, *American Indian Culture and Research Journal*, 45:1 (2021), pp. 95–122; Sean T. Mitchell, *Constellations of Inequality: Space, Race, and Utopia in Brazil* (Chicago: University of Chicago Press, 2017); Peter Redfield, *Space in the Tropics: From Convicts to Rockets in French Guiana* (Berkeley: University of California Press, 2000).

¹⁹ Daniel Deudney, *Dark Skies: Space Expansionism, Planetary Geopolitics, and the Ends of Humanity* (New York: Oxford University Press, 2020), p. 105.

²⁰ See Cemal Burak Tansel and Lisa Tilley, ‘Reproducing socio-ecological Life from below: Towards a planetary economy of the global majority’, *Review of International Studies*, 50 (2024), pp. 514–33.

The question of whether ambitious national and entrepreneurial plans for outer space exploration and colonisation will bear any fruit will remain undecided for some time. However, it seems extremely likely that efforts to achieve these plans will substantially alter political dynamics and debates for the foreseeable future – even if their primary outcome is a gargantuan waste of financial and energy resources. Some interactive effects may be primarily ideological, as the belief in space colonisation as a means of escaping catastrophic climate change displaces the hard decisions required to address that problem. Other effects may be more material as tentative efforts to address hypothetical challenges posed by asteroidal collision through deflection or orbital reorientation may have the perverse effect of increasing the chance of such a collision.²¹ For these reasons, while sober IR theorists may be inclined to offer wry smiles at the techno-fantasies of individuals such as Elon Musk and Jeff Bezos, they simultaneously cannot afford to avoid ‘looking up’.

Looking up from a flat-Earth

Dispensing with these fallacies is only the first step required in our efforts to confront our terrestrial biases. The next step involves more fundamental reform of the discipline’s set of shared assumptions about what makes up the social and political world. The first terrestrial assumption is ‘flat-Earthism’. This involves conceptualising politics as a phenomenon that plays out on a two-dimensional plane that roughly corresponds to a Mercator projection of the Earth’s surface. ‘Flat-Earthism’ has tended to limit our ability to see how political power operates through three-dimensional space. To be more precise, we have tended to primarily focus on how power is extended, prevented, or relationally constituted *horizontally* across two-dimensional representations of the Earth’s surface, rather than *vertically*, upwards into the air, or downwards below the ground.

To develop this point, we find it helpful to move away from more abstract generalisations about the ‘discipline of IR’, in order to focus on the way this assumption surfaces in a specific body of thought. In the following account, we limit ourselves to a discussion of flat-Earthism, and efforts to move beyond it, in ‘anti-colonial IR’. The term ‘anti-colonial IR’ refers to strands of research in International Relations that engage critically with colonial institutions, decolonisation processes, and their legacies. In this context, we include within this broad umbrella work that formally affiliates with the labels ‘decolonial’ and ‘post-colonial’ theory, and related works taking place under the banners of critical theory, constructivism, etc. These different bodies of work share a concern for documenting and analysing (a) colonial institutions and practices; (b) forms of domination engendered by these institutions and practices; and (c) historical legacies of colonialism in both material residues and ideational frameworks. In choosing anti-colonial IR as an exemplar, we are not denying the significance of other brands of IR theory such as ‘liberalism’, ‘realism’ etc. and their potential contributions to theorising the politics of outer space.²² Instead, we merely believe that anti-colonial theorising serves as a useful example for thinking through both the merits and limitations of the flat-Earthist assumption.

We can begin to get a sense of the origins of flat-Earthism by recognising how this assumption first appeared in colonial practice and thought. For example, a flat-Earthist imagery underlay the Treaty of Tordesillas, which divided the ‘new’ land outside of Europe that colonists had supposedly ‘discovered’ into a Spanish West and a Portuguese East. This was done through the invocation of a single line of demarcation between these two zones and gave licence to colonial authorities based in Europe to extend their sovereign authority horizontally to large parts of the Americas. The flat-Earthist concept of a world divided by a single line between East and West created the hope of a clear and simple division between competing sovereigns.

²¹Deudney, *Dark Skies*, pp. 145–80.

²²We would not want to exclude the possibility for space expansionism to proceed along more cooperative or cosmopolitan lines without distinct colonial undertones. For examples, see Dimitrios Strokos, ‘Engineering world society? Scientists, internationalism, and the advent of the Space Age’, *International Politics*, 55 (2018), pp.73–90, Ma’fa K. Davis Cross, ‘The social construction of the space race: Then and now’, *International Affairs*, 95:6 (2019), pp. 1403–21.

Flat-Earthist ideas underpinned and simplified the empires' broad jurisdictional claims to territory which colonists hardly knew, let alone controlled. Yet flat-Earthist ideas could also be turned against colonial institutions of rule, as they underpinned efforts to *undermine* the legitimacy of European colonial claims many years later. For example, the principle of self-determination was largely 'flat-Earthist'. This principle differentiated the entirety of the landed surface of the globe into a series of two-dimensional territories to be ruled by the people and/or their leaders. It also set rules to prevent a state from extending its power too far into the territory of another. Using this image of the world as a series of claims to distinct territories, the Declaration on Decolonization expressed a common commitment to 'noninterference in the internal affairs of all States, and respect for the sovereign rights of all peoples and their territorial integrity'.²³

As this example suggests, while flat-Earthism may have emerged within a modernist order in which European empires were dominant, the assumption is not inherently wedded to the cause of extending or maintaining European colonial rule. This adaptability partly explains why anti-colonial IR theory has been able to generate meaningful critiques of coloniality without necessarily abandoning the flat-Earthist presumption it produced. For example, anti-colonial IR theory has made a variety of critiques of the proliferation of (post-)colonial inequalities, including through geopolitical principles such as core/periphery, the global colour line, and Global North/Global South.²⁴ These critiques, urgent and critical as they are (and will continue to be), remain concerned with the horizontal extension of power across two-dimensional space. As such, they also continue to rely on spatial imaginaries of political relations as projected onto a two-dimensional map, which gives meaning to the terms 'North' or 'South'.

Going beyond these imaginaries of two-dimensional space, researchers have also played with flat-Earthist representations in ways that expose the limitations of the assumption. A good example is offered by Olivia Rutazibwa and Robbie Shilliam. They move anti-colonial thinking beyond the limited geopolitical framework of a Global North and Global South by pointing to the greater complexity of post-colonial political geographies. They point out that migration from the Global South to the North has produced a 'global South in the North' where migrant communities take up decolonial politics within the social settings and political institutions of the former colonial 'metropole'.²⁵ Similarly, they point out that global capitalist production systems have resulted in a 'global North in the Global South' where elite groups located in former colonial states take on and reapply the logics and ideologies of coloniality to their fellow citizens and jurisdictions, from positions of extreme privilege and wealth.²⁶ Crucially, here we have an example of how anti-colonial thinking can challenge the specific forms of flat-Earthist spaces that are reified by colonial thinking, while still not fundamentally rejecting or replacing the preferred flat-Earthist assumption that lies beneath it.

Given this relative conceptual 'plasticity' of a flat-Earthist assumption, it should come as no surprise that many inquiries into the international politics of outer space retain traces of a flat-Earthist understanding of spatialities. This is especially the case for studies that centre a world of territorial states in their understanding of space politics.²⁷ These lines of inquiry remain relevant, as states continue to be the main actors in most space exploration endeavours. Space exploration is financed

²³United Nations General Assembly, Fifteenth Session, Declaration on the Granting of Independence to Colonial Countries and Peoples, 1514 (XV).

²⁴E.g. Siba Grovogu, 'A revolution nonetheless: The Global South in International Relations', *The Global South*, 5:1 (2011), pp. 175–90; Arlene B. Tickner, 'Core, periphery and (neo) imperialist International Relations', *European Journal of International Relations*, 19:3 (2013), pp. 627–46; Arlene B. Tickner and Karen Smith (eds), *International Relations from the Global South: Worlds of Difference* (London: Routledge, 2020).

²⁵Olivia U. Rutazibwa and Robbie Shilliam, 'Postcolonial politics: An introduction', in Olivia U. Rutazibwa and Robbie Shilliam (eds), *Routledge Handbook of Postcolonial Politics* (London: Routledge, 2018), pp. 1–15.

²⁶*Ibid.*, pp. 4–5.

²⁷Nayef R. F. Al-Rodhan, *Meta-Geopolitics of Outer Space* (London: Palgrave Macmillan, 2012); Bormann and Sheehan (eds), *Securing Outer Space*.

by states, which are engaging with space for Earthly purposes – for example to address security concerns or for the possible resource gains.²⁸ While the current moment sees the increasing entry of non-state actors into the space sector, these actors tend to work closely together with state actors. Legally, states remain responsible for activities carried out in outer space by non-state actors, and as such states are required to authorise and continuously supervise these activities.²⁹ Therefore, traditional lines of IR scholarship focused on the balance of power, war, and security that consider an outer space dimension can benefit from staying within such a statist spatial perspective.

Yet this also means that in many of these geopolitical formulations, outer space continues to play the role of a ‘side dish’ to the ‘main course’ which is served up back on a ‘flat-Earth’. In these formulations, the realm of politics remains constituted by power imbalances between or among territorial nation states, and the air and the sky are recognised as merely the means through which such power is obtained and expressed. While the political dynamics of a ‘flat-Earth’ help us understand what is at stake in outer space politics, from interstate politics to international inequalities, what remains underdeveloped is an attempt to theorise the new ways in which politics takes shape as influential actors increase their capacity to access outer space.

In this sense, it is important to recognise that the spatial norms we have developed to understand a ‘flat-Earth’ often prove inadequate when we begin to apply them to outer space. Jill Stuart draws our attention to this problem in ongoing struggles over who owns the International Space Station (ISS). The ISS is a research laboratory, run by five space agencies, that orbits the Earth at 420 km altitude, beyond any territorial claims of national airspace.³⁰ While the ISS is thus not beholden to the principle of territoriality on Earth, international treaties negotiated for the ISS still ‘provide a unique system of governance that establishes rule over the “territory” of the station.’³¹ The recreation of territoriality in space is done specifically by giving the ‘responsibility over individual component parts of the station to the member partner that launched it.’³² This, as Stuart writes, has generated an unwieldy outcome: ‘the station is a sort of Franken-station, with its component parts physically connected and interdependent, but where those parts are ultimately sections of territory belonging to individual partners.’³³

This shows that the problem is not simply that the spatial principles we have established for a ‘flat-Earth’ become insufficient in space, but that power itself assumes spatial forms that require new understandings and concepts. In the example above, attempts were made to redeploy a flat-Earthist spatial ontology to the governance of the ISS. Parts of the station remained subject to the launching state’s ‘flat’ domestic legislation, even as they were propelled into space, far beyond this state’s traditional territory. Yet the result is not a continuation of Earthly territoriality in space, but rather an entirely new spatial form. As a spatial form, the station has become an amalgamation of different territorial jurisdictions as tied to each constitutive part of the station. The ISS connects these national territories, which on Earth remain far apart, into one physically interdependent object. As it circles Earth, this new composite object challenges conventional notions of territorial integrity. The spatial form of the ISS, as well as many others emerging through outer space developments, thus cannot simply be reduced to a flat-Earthist ontology.

To address these new spatial forms, IR theorists could draw more heavily on developments in parallel disciplines. For the past several decades, social scientists have been critiquing and moving

²⁸ See Mark Lacy, ‘The future of control/The control of the future: Global (Dis)order and the weaponsation of everywhere in 2074’, *Review of International Studies*, 50 (2024), pp. 560–78.

²⁹ George Kyriakopoulos, ‘Legal challenges posed by the action of non-state actors in outer space’, in Maria Manoli and Sandy Belle Habchi (eds), *Conflicts in Space and the Rule of Law* (Montreal: McGill University IASL, 2017), pp. 273–90.

³⁰ Flat-Earthist spatial imaginaries are almost, but not entirely flat, as they move upwards slightly by recognising sovereign airspace. While the upper limit of this airspace is contested, claims range roughly from 30–110 km altitude.

³¹ Jill Stuart, ‘Unbundling sovereignty, territory and the state in outer space: Two approaches’, in Natalie Bormann and Michael Sheehan (eds), *Securing Outer Space: International Relations Theory and the Politics of Space* (London: Routledge, 2009), pp. 8–23 (p. 13).

³² *Ibid.*

³³ *Ibid.*

beyond statist and ‘flat’ assertions of political space. One of the most promising developments has involved the study of the ‘vertical’ and ‘volumetric’ character of space and power, and more specifically actions, infrastructures, and processes which are situated either above or underneath the Earth’s surface.³⁴ Much of this work has taken a direct interest in the manner in which states and other powerful political actors have attempted to extend their power vertically by (a) physically occupying parts of the Earth’s atmosphere or the oceanic depths; (b) augmenting their power over the Earth’s surface by developing technologies, including planes and drones, submarines, and rockets that are situated at a distance from the Earth’s surface; and (c) laying claim to and apportioning rights to volumetric space through the development of no-fly zones, mineral deposits, or fish reserves.

This work on verticality and volume has further demonstrated that the flat-Earthist spatial cosmology engendered by coloniality was itself an abstraction from the reality of historical processes. Contrary to its representation on colonial maps, the projection of colonial power has always been three-dimensional. From the developments in astronomy that allowed for the improvements in European navigational systems, to the gradually expanding capacity to create value out of colonial possessions through mining technology, to the radical impact of airpower in shaping 20th-century political relations, there has been a constant interaction between, on the one hand, surface-level politics and, on the other, dynamics occurring in vertical dimensions. It is important to understand the exploration and militarisation of outer space as connected to these prior colonial forms of vertical politics. Indeed, coloniality is implicit in every reference to space as a ‘Final Frontier’ and plainly present in the defining rhetorical moments of space history and space culture.³⁵ From its earliest days, NASA’s agenda has been shaped by a strong analogic link between public exultations of past conquests and conquests to come.³⁶

Yet there are also ways in which outer space presents new forms and challenges, which we can start to grasp by foregrounding the vertical dimension. It may help us to consider how an appreciation of verticality can enrich anti-colonial theories in IR specifically by thinking through a specific empirical example: the Bogotá Declaration. In the 1970s, many post-colonial states were opposed to the leading idea of turning space into a global commons as proposed by the 1967 Outer Space Treaty. The idea of a global commons favoured the interests of those states that were already capable of launching rockets, controlling satellites, and conducting missions beyond the Earth’s orbit. As Jason Beery argues, by constructing outer space as ‘global’ rather than ‘international’, leading space powers ensured that there would be ‘a very stark difference between the laws that governed outer space and those that governed terrestrial sovereign territories.’³⁷ In essence, a ‘cosmopolitan’ understanding of sovereignty only served to exacerbate (post-)colonial inequalities among states and peoples back on a flat-Earth. Furthermore, some post-colonial states had a different asset they wanted to leverage in this unfolding space race: their equatorial location. Recognising this inequality, Brazil, Colombia, Congo, Ecuador, Indonesia, Kenya, and Zaire banded together to assert their claim over their skies through the Bogotá Declaration. In the formulation of the Bogotá Declaration, territorial sovereignty would not only extend upwards into a nation’s airspace, but stretch vertically deep past the Earth’s atmosphere, to give these seven equatorial countries authority over the rapidly expanding infrastructure of war-making, surveillance, and wealth generation that was being built above their heads.

³⁴ Franck Billé, *Voluminous States: Sovereignty, Materiality, and the Territorial Imagination* (Durham, NC: Duke University Press, 2020); Stuart Elden, ‘Secure the volume: Vertical geopolitics and the depth of power’, *Political Geography*, 34 (2013), pp. 35–51; John H. Herz, *International Politics in the Atomic Age* (New York: Columbia University Press, 1959).

³⁵ Alexander C.T. Geppert (ed.), *Imagining Outer Space: European Astroculture in the Twentieth Century* (Basingstoke: Palgrave Macmillan, 2012); Howard E. McCurdy, *Space and the American Imagination* (Baltimore, MD: Johns Hopkins University Press, 2011); Natalie B. Treviño, ‘Coloniality and the cosmos’, in Juan Francisco Salazar and Alice Gorman (eds), *The Routledge Handbook of Social Studies of Outer Space* (London: Routledge, 2023), pp. 226–37.

³⁶ Fred Scharmen, *Space Forces: A Critical History of Life in Outer Space* (London: Verso, 2021).

³⁷ Beery, ‘Unearthing global natures’, p. 96.

This claim to orbital sovereignty did not go down well with the leading ‘space race’ powers. According to the latter, the principle of territorial sovereignty could not be extended out and beyond the Earth’s atmosphere. They argued that extending sovereignty upwards ad infinitum – in the same way as airspace is governed – would generate a kaleidoscopic form of sovereignty in outer space, consisting of constantly shifting claims to different parts of different celestial bodies. After all, the Earth is constantly rotating on its axis and orbiting the sun, while our solar system is moving through the Milky Way within an expanding universe. Wilfred Jenks, the lawyer defending the US case against the Bogotá Declaration at the United Nations, therefore argued that ‘a projection into space of sovereignties based on particular areas of the Earth’s surface would give us a series of adjacent irregularly shaped cones with a constantly changing content. Celestial bodies would move in and out of these cones all the time.’³⁸ Instead, the ‘space race’ powers argued that the cosmopolitan principle of rule originally outlined in the Outer Space Treaty should be maintained.

These competing claims point us to the stakes involved in theorising politics beyond Earth. Political practices and organising principles, such as territorial sovereignty, do not necessarily mean the same thing in space and are bound to be reformulated and contested. While the positions of the parties in this dispute were clearly defined by competing national and state interests, they were compelled to reconstitute their claims to domination (United States) and non-domination (Bogotá signatories) in a new idiom, adapted to the vertical reality of outer space. For the Bogotá signatories, this involved simply stretching a flat-Earthist claim vertically to its maximum extent to claim their fair share of outer space resources. For the US representatives, it involved establishing a hard break at a certain elevation, between the Earth’s sovereign and territorial property regime and the construction of a new cosmopolitan realm in which their technological superiority would afford them near-complete supremacy.

As this example suggests, thinking through core questions of sovereignty, power, and domination has compelled political actors to reformulate or move beyond their flat-Earthist assumptions and add vertical depth to their claims to power and authority. The changing forms of domination and contestation this gives rise to should be seen as closely connected to the three-dimensional projection of power on Earth itself, as there are many parallels between the high modernist aspirations of conquest by space explorers and histories of colonial conquest on Earth. Yet we have also demonstrated that there are ways in which this convergence of modernity and coloniality, often theorised through the colonial matrix of power, is taking new forms in outer space.³⁹ Inequalities are not simply reproduced by activities which occur beyond the Earth’s atmosphere but are profoundly transformed, for example through the equator as a new axis of power or through constructions of outer space as a global commons. It is by challenging and departing from flat-Earthist theoretical assumptions that we can examine how these transformations play out in practice.

In so doing, it is important to keep in mind that there are many ways of thinking that have never been flat-Earthist, including Indigenous cosmologies. While ‘there is no single Indigenous view about the significance of space programs’ or about the meaning and significance of human interactions with space more generally, space does figure prominently within many Indigenous cosmologies.⁴⁰ Many – if not most – Indigenous cosmologies have always been more-than-terrestrial, ‘oriented to the Sky as well as the ground.’⁴¹ For example, M. Jane Young recounts that when a group of Inuit people in Alaska were told of the Moon landing, they replied ‘We didn’t know this was the first time you white people had been to the moon. Our shamans have been going for years. They go

³⁸ Ibid., p. 95.

³⁹ Walter D. Mignolo and Catherine E. Walsh, *On Decoloniality: Concepts, Analytics, Praxis* (Durham, NC: Duke University Press, 2018); Anibal Quijano, ‘Coloniality and modernity/rationality’, *Cultural Studies*, 21:2–3 (2007), pp. 168–78.

⁴⁰ Tony Milligan, ‘From the sky to the ground: Indigenous peoples in an age of space expansion’, *Space Policy*, 63 (2023), (p. 2); for a view on Indigenous peoples as defenders of a different space science, see De Wit Douglas Kilgore, *Afrofuturism: Science, Race, and Visions of Utopia in Space* (Philadelphia: University of Pennsylvania Press, 2003).

⁴¹ Milligan, ‘From the sky to the ground’, p. 4.

all the time.⁴² In this way, ‘Indigenous people have always been engaged with the worlds beyond the Earth, in ways that often stood counter to accepted “settler” conventions of space exploration.’⁴³ Emergent forms of Indigenous futurism build upon these historical cosmologies to understand relational connections between the Earth and the wider cosmos, conjuring ways of interacting with outer space that do not end in conquest.⁴⁴

In this sense, theorising politics beyond Earth is not about IR ‘discovering’ outer space or starting completely anew, but about connecting to those ways of thinking that allow us to ask (and tentatively answer) urgent questions about the momentous and often alarming political phenomena that emerge. This includes genealogies of vertical theorising and Indigenous cosmologies as well as other imaginative modes of thinking that get us beyond the theoretical presumption of a flat-Earth. In this way, we can question – rather than assume – the extent to which geopolitical principles (such as territorial sovereignty, but also core/periphery, Global North/Global South) capture the forms of power and domination that emerge beyond Earth. In many cases, human engagement with outer space may challenge the principles and distinctions that are central to the most urgent Earthly political issues, and our theorisations thereof. This means that for anti-colonial IR theorists in particular, and we would suggest IR theorists more generally, the challenge is to underline the connections between outer space and Earthly political struggles, while also seeing how these struggles are themselves deepened and transformed in outer space.

Provincialising human habitation

Flat-Earthist assumptions have been particularly adaptable, and therefore durable, components of IR theory. This durability can be partly explained by the fact that this assumption has been buttressed by a second terrestrial assumption in IR: ‘human habitationism’. This assumption holds that developments in outer space will form a repetition or extension of politics as it has emerged on the habitable surface of our planet. While human politics on Earth has developed in very specific material circumstances, such as 9.8 m/s² gravity, oxygen-rich air, moderate temperatures, and atmospheric pressure, the assumption is that politics will work the same way regardless of these circumstances. Even to us writing this article, these circumstances are ‘normal’, as they allow us to sit down on a chair, maintain a degree of thermal comfort, and breathe unsupported by oxygen systems.

In space, the material conditions vastly differ from those experienced on Earth. The Earth’s surface experiences atmospheric pressure as gravity pulls objects toward the centre of the planet, giving weight to everything. In space, especially in microgravity, objects experience a state of continuous free fall, resulting in a sensation of weightlessness. Space is a near-perfect vacuum, almost devoid of the matter and molecules that make up the Earth’s atmosphere, affecting how materials behave and interact. Additionally, Earth’s atmosphere helps regulate temperature by trapping heat, while in space, there is a vast temperature range due to the lack of an atmosphere to retain or conduct heat. Spacecraft can experience extreme heat when exposed to the Sun and extreme cold in shadowed areas. Finally, space is exposed to various forms of radiation, including solar radiation, galactic cosmic rays, and other high-energy particles, whereas we are partly shielded from this on our home planet through the atmosphere and the Earth’s magnetic field.

While these extraterrestrial forces are generally acknowledged as a challenge for astronautical engineering, as space technologies need to be improved and updated continuously to withstand the extreme conditions, they have yet to be fully integrated in the way we think about the politics of outer space. Instead, the radically different material conditions present in outer space are generally

⁴²M. Jane Young, ‘“Pity the Indians of outer space”: Native American views of the space program’, *Western Folklore*, 46:4 (1987), pp. 269–79 (p. 272).

⁴³Deondre Smiles, ‘The settler logics of (outer) space’, *Society & Space* (26 October 2020), available at: {<https://www.societyandspace.org/articles/the-settler-logics-of-outer-space>}.

⁴⁴Lou Cornum, ‘The Space NDN’s star map’, *The New Inquiry* (26 January 2015), available at: {<https://thenewinquiry.com/the-space-ndns-star-map/>}.

not considered politically significant at all. Faced with the challenge of demonstrating that outer space is not an isolated, unique, or inconsequential realm of political life, IR scholars paving the way for the study of outer space have come to instead emphasise the commonalities with Earthly politics. Bleddyn E. Bowen, for example, states that ‘there is a common perception that outer space is a politically different or separate realm to Earth.’⁴⁵ Yet, he argues: ‘For better and worse, humanity’s use of outer space is shaped by Terran politics, and the solar system a rich vista waiting for the humanities to join the engineers and the scientists.’⁴⁶ Outer space is really ‘just another place where human politics continues as it does on Earth.’⁴⁷ In this way, political continuity is established between inner space (Earth and its atmosphere) and outer space (beyond the atmosphere).

It is tempting to theorise outer space as a mere canvas for Earthly politics. For many space enthusiasts, the aim is precisely to extend the realm of human existence and influence towards outer space. In space exploration, it is often assumed that ‘the drive to expand beyond earthly limits is a natural and inevitable characteristic of an amorphously defined human subject or species.’⁴⁸ As humans advance scientific discovery about planet Earth, they will naturally seek to extend their view further outwards, towards the limitless horizon that is outer space. While commercial and scientific space exploration endeavours differ in some critical respects, they are united in their aim to expand the realm of the humanly possible. In an era of increasing awareness of the ‘planetary boundaries’ of human activity, space exploration forms a continuing outlet for expansionist fantasies, whether through dreams of an interstellar gold rush or plans for humanity as an interplanetary species. ‘Within most expansionist narratives, space exploration becomes represented as a shared and perhaps even global human quest: ‘a profoundly human aspiration that unites all people in all places.’⁴⁹

Such imaginaries are not only highly anthropocentric, placing the human at the centre of the wider universe, but also geocentric (or Earth-centric), in that they interpret the nature and significance of outer space through Earthly frameworks and regimes of power. Although these activities are oriented towards outer space as a literal and physical place beyond the human world, outer space itself becomes subsumed in terrestrial aspirations and fantasies. Space critics tend to criticise these lofty ambitions, yet in so doing, they also emphasise the continuity between Earthly politics and outer space. In their views, space exploration should not be seen as a shared aspiration, but as the vehicle of a particular set of interests which extend human disparities in wealth and power.⁵⁰ Through space endeavours, such as new frontiers of resource mining, the geopolitics of extraction and wealth creation are extended beyond Earth.⁵¹ While the bulk of criticism tends to be on commercial space enterprise, these voices have strongly emphasised the deepening connections between space science and the commercial space industry. The science of outer space, Dickens and Ormrod write, ‘is now being deployed to humanise the cosmos in ways that not only reproduce the social order, but extend this order indefinitely into the cosmos.’⁵²

These poignant and necessary critiques often retain a sense of parallelism between ‘inner space’ and ‘outer space’. While we are supportive of these efforts to consider urgent political phenomena emerging in outer space, we believe that further theoretical steps are necessary. We argue that it

⁴⁵Bleddyn E. Bowen, ‘Astropolitics and International Relations’, in Tom James (ed.), *Deep Space Commodities: Exploration, Production and Trading* (Cham: Springer, 2018), pp. 151–57 (p. 151).

⁴⁶*Ibid.*, p. 156.

⁴⁷*Ibid.*

⁴⁸Matthew Kearnes and Thom van Dooren, ‘Rethinking the final frontier: Cosmo-logics and an ethic of interstellar flourishing’, *GeoHumanities*, 3:1 (2017), pp. 178–97 (p. 179).

⁴⁹Alice Gorman, ‘La terre et l’espace: Rockets, prisons, protests and heritage in Australia and French Guiana’, *Archaeologies*, 3:2 (2007), pp. 153–68 (pp. 154–5).

⁵⁰Victor L. Shammass and Tomas B. Hølen, ‘One giant leap for capitalistkind: Private enterprise in outer space’, *Palgrave Communications*, 5:1 (2019), pp. 1–9.

⁵¹Julie Michelle Klinger, *Rare Earth Frontiers: From Terrestrial Subsoils to Lunar Landscapes* (Ithaca, NY: Cornell University Press, 2018).

⁵²Dickens and Ormrod, *Cosmic Society: Towards a Sociology of the Universe* (London: Routledge, 2007), p. 189.

is important to theorise outer space as part of the political realm without simply equating it to Earthly spaces. This is because outer space, as an environment highly different from Earth, offers distinct possibilities and dangers for politics. The extreme material conditions of space influence how human endeavours in space are planned and regulated, as scientists, lawyers, and politicians transform Earthly frameworks to these specific circumstances.⁵³ These material circumstances are also expected to influence the feasibility and methods of emergent space initiatives – for example, space resource extraction – as the specific composition of different celestial bodies such as asteroids and the Moon shapes how geopolitical tensions and conflicts over resource ownership and utilisation may play out.⁵⁴ Finally, as we discuss in more depth below, these conditions impact what human settlements in outer space and their political relations may come to look like in the coming decades. Therefore, material conditions are key to studying politics beyond Earth.

Understanding how the politics of outer space is influenced by its material conditions fits within longer trends of materialist theorising. As we discuss below, scholars in and beyond IR have already started conducting the work of considering the significance of different kinds of Earthly material conditions to the conduct of politics. The aim in these sorts of works is not to argue for some renewed kind of environmental determinism, but rather to understand how political visions and practices intersect with material circumstances. In the age of empire, for example, colonisers deemed environments with tropical climates less ‘suitable’ for politics.⁵⁵ Regions of the globe with climates similar to Western Europe were sought out for colonisation, whereas those with more tropical climates were deemed inappropriate for the flourishing of civilisation. To establish a sense of thermal comfort for Europeans, climate control was introduced in the colonies, and this was also thought to lay the conditions for advanced political organisation over time.

In recent years, scholars have turned to the study of spaces that are often considered to be on the fringes of the political realm due to their inhospitable or harsh physical conditions, such as oceanic or polar environments.⁵⁶ In so doing, they have had to contend with IR’s core assumptions, which often inhibit an understanding of the political significance of different material environments. The challenge scholars face is that, even today, it is assumed that politics works the same regardless of material circumstances. ‘IR has been a patho-logical “landlubber discipline”, Benjamin de Carvalho and Halvard Leira argue, as it either avoids engagement with the sea or regards it merely as an extension of land.’⁵⁷ Practices developed within highly specific material conditions, such as a land-based existence and moderate temperatures, cloud understandings of what political organisation may look like elsewhere. These conditions, which are generally most favourable to human habitation and host the largest human population densities on Earth, loom large in our understanding of politics in a more general sense.

To interrogate these assumed conditions, prior scholarship has identified how the conduct of politics in different kinds of environments stretches the limits of established understandings, including familiar political categories and institutions.⁵⁸ This is because the characteristics of an environment make certain political courses of action more or less likely. As Daniel Lambach notes,

⁵³For a history of these adaptations, see Peterson, *International Regimes for the Final Frontier*.

⁵⁴Namrata Goswami and Peter A. Garretson, *Scramble for the Skies: The Great Power Competition to Control the Resources of Outer Space* (London: Lexington Books, 2020).

⁵⁵Dustin Valen, ‘Imperial atmospheres: Race and climate control on the Niger’, *ABE Journal—Architecture beyond Europe*, 17 (2020), available at <https://journals.openedition.org/abe/8106>.

⁵⁶Benjamin de Carvalho and Halvard Leira (eds), *The Sea and International Relations* (Manchester: Manchester University Press, 2022); Christian Bueger, Timothy Edmunds, and Barry J. Ryan, ‘Maritime security: The uncharted politics of the global sea’, *International Affairs*, 95:5 (2019), pp. 971–8; Joanne Yao, ‘An international hierarchy of science: Conquest, cooperation, and the 1959 Antarctic treaty system’, *European Journal of International Relations*, 27:4 (2021), pp. 995–1019.

⁵⁷Benjamin de Carvalho and Halvard Leira, ‘Introduction: Staring at the sea’, in Benjamin de Carvalho and Halvard Leira (eds), *The Sea and International Relations* (Manchester: Manchester University Press, 2022), pp. 1–25 (p. 1).

⁵⁸Kimberley Peters, Philip Steinberg, and Elaine Stratford (eds), *Territory beyond Terra* (Lanham, MD: Rowman & Littlefield, 2018).

‘in a crude physical sense, the environmental properties of a space matter for politics – the governance of space works differently on land, on the high seas and in outer space.’⁵⁹ While political practices are not determined by their environment, they necessarily need to be adapted to the physical conditions in which they take place. The materiality of the sea, for example, evades conventional understandings of political boundaries. Water is in constant motion, and as a result, its territory and location are not fixed, which means that the sea ‘challenges processes of bordering with a particular intensity not found on land.’⁶⁰ This kind of understanding is not based on an understanding of the environment as an ‘empty space against which human “things” move,’ but rather on the presumption that the environment itself is made up of all kinds of processes, in which humans play a part.⁶¹ Therefore, challenging the assumption of human habitationism is not solely about acknowledging the material characteristics of different environments, but about interrogating how material processes intersect with situated histories of political governance and control.

Therefore, studies have outlined in a concrete, practical sense how politics has come to be conducted differently in environments due to the influence of material characteristics. Lambach has studied the adaptation of political practices to the ‘extreme environment’ of the Arctic Circle. He outlines the extreme physical aspects of human bodily presence in the Arctic: ‘[the] ability to withstand cold and darkness, the bodily risks of icy waters and the psychosomatic effects of isolation and confinement in small habitable spaces.’⁶² These challenges shape politics in the Arctic, as they mean that ‘governance is by necessity more distant and detached, mediated by technologies of surveillance and control.’⁶³ In a similar way, Janet Martin-Nielsen recounts how US forces post-World War II were engaged in an ‘other cold war’ in the Arctic: the struggle with an icy environment that posed a threat to American capabilities in the region.⁶⁴ The US desire to control Greenland, which was considered important to safeguarding national security, was complicated by the island’s remote geography, challenging climate, and barren landscape.⁶⁵ Faced with polar white-outs, drifting snow, and fog, the US military resigned itself to what she calls a ‘détente,’ the decision to work ‘with the cold rather than against it’ by using snow and ice as building materials for military operations and installations, while relinquishing grand ambitions of hegemonic control over the Arctic.⁶⁶

These analyses allude to the potential of challenging persistent assumptions of human habitationism in our conceptions of politics. Rather than assuming that politics works the same way regardless of physical circumstances, scholars should investigate how politics has come to be conducted differently outside of the most densely populated zones of human habitation, not only by state governments and their militaries, as in the examples above, but also within longer histories of Indigenous political organisation in places such as the Arctic.

This is of utmost relevance to theorising the politics of outer space. After all, oceanic and polar environments have long been considered analogues for the conditions of space, and drawing analogies to these environments formed a key part of international deliberations on how human activities in space ought to be governed.⁶⁷ Due to the extreme pressure and lack of oxygen, space agencies such as NASA have long conducted missions in the deep seas to test technologies and to

⁵⁹Daniel Lambach, ‘Space, scale, and global politics: Towards a critical approach to space in International Relations,’ *Review of International Studies*, 48:2 (2022), pp. 282–300 (p. 292).

⁶⁰Philip Steinberg and Kimberley Peters, ‘Wet ontologies, fluid spaces: Giving depth to volume through oceanic thinking,’ *Environment and Planning D: Society and Space*, 33:2 (2015), pp. 247–64 (p. 254).

⁶¹Kurki, *International Relations in a Relational Universe*, p. 125.

⁶²Lambach, ‘Space, scale, and global politics,’ p. 299.

⁶³*Ibid.*, p. 295.

⁶⁴Janet Martin-Nielsen, ‘The other cold war: The United States and Greenland’s ice sheet environment, 1948–1966,’ *Journal of Historical Geography*, 38:1 (2012), pp. 69–80.

⁶⁵*Ibid.*, p. 69.

⁶⁶*Ibid.*, p. 79.

⁶⁷Peterson, *International Regimes for the Final Frontier*.

find clues to what life might look like on other planets.⁶⁸ Because of the isolation and lack of vegetation, human endeavours in Antarctica are often thought to provide a preview of what human presence in the solar system might come to resemble, that is, limited outposts rather than permanent settlements.⁶⁹ The harsh physical characteristics of these environments not only require specific technologies, practices, and protocols to sustain human life but also make the materials conventionally used for building and supporting human societies notoriously challenging to govern and control.⁷⁰

Due to these challenging material conditions, spacefaring has never been a strictly human endeavour. From the dogs and monkeys on early rocket missions to the plants and rodents involved in ISS experiments, non-human explorers (or hostages?) have always been an integral part of space exploration.⁷¹ To avoid sacrificing humans in experimental missions, animals with a similar physiology were selected as the first astronauts. From the early days of space exploration, the use of animal astronauts in experiments aimed to tackle essential questions about the fundamental survival of biological beings in space.⁷² These inquiries spanned the examination of physiological changes arising from space flights to ensuring the safety of space vehicles and equipment. It was therefore important that these animals would share as many characteristics as possible with humans, yet not be human.⁷³ These animals made possible the human 'bridge to the future.'⁷⁴ Space exploration would similarly be impossible without mechanical explorers, the most important one being the rover.⁷⁵ In recent decades, robotic vehicles have become such a crucial part of the human access to and view of outer space that some argue that the conventional distinction between humans and robots no longer applies in space.⁷⁶

Paradoxically, these elaborate experimental and technological attempts at accessing space, while built on the premise of the human capacity to transcend their planetary home, only underline how much human lives depend on the existence of Earthly habitable conditions. Human spacefaring is only made possible through the creation of these very same habitable conditions within the radically different environments of outer space. The use of animals with a similar physiology as the first astronauts reveals the inescapable animality of humans themselves, that is, all the commonalities that humans share with other oxygen-dependent, 9.8 m/s² gravity-bound creatures on planet Earth. While the fact that non-humans have been made to travel on board of human-built spaceships has been rooted in the belief of human control over the environment, including fantasies of further expanding this control out into space, its underlying rationale underlines the very real limits of human control.

In this sense, extraterrestrial spaces – like Earthly oceanic or polar spaces – confront us with the limits of human habitational thinking. While scholars have already started considering to what extent different Earthly governance approaches, from libertarianism to communitarianism, might be applicable to human settlements in space, it is crucial to analyse precisely how any such approach would run up against these habitational limits.⁷⁷ Paving the way for such analyses is David

⁶⁸ Stefan Helmreich, *Alien Ocean: Anthropological Voyages in Microbial Seas* (Berkeley: University of California Press, 2009).

⁶⁹ Stephen J. Pyne, 'The extraterrestrial Earth: Antarctica as analogue for space exploration', *Space Policy*, 23:3 (2007), pp. 147–9.

⁷⁰ Andrew Barry and Evelina Gambino, 'Pipeline geopolitics: Subaquatic materials and the tactical point', *Geopolitics*, 25:1 (2020), pp. 109–42 (p. 118).

⁷¹ Katarina Damjanov, 'Accounting for non-humans in space exploration', *Space Policy*, 43 (2018), pp. 18–23.

⁷² Jane Johnson, 'Vulnerable cargo: The sacrifice of animal astronauts', in Jai Galliot (ed.), *Commercial Space Exploration: Ethics, Policy, and Governance* (London: Routledge, 2016), pp. 259–69 (p. 283).

⁷³ Ibid.

⁷⁴ Colin Burgess and Chris Dubbs, *Animals in Space: From Research Rockets to the Space Shuttle* (New York: Springer Science & Business Media, 2007), p. xlviii.

⁷⁵ Janet Vertesi, *Seeing Like a Rover: How Robots, Teams, and Images Craft Knowledge of Mars* (Chicago: University of Chicago Press, 2015).

⁷⁶ Francesca Ferrando, 'Why space migration must be posthuman', in James S. J. Schwartz and Tony Milligan (eds), *The Ethics of Space Exploration* (Cham: Springer, 2016), pp. 137–52 (p. 142).

⁷⁷ Nikola Schmidt and Petr Bohacek, 'First space colony: What political system could we expect?', *Space Policy*, 56 (2021).

Valentine's work, which argues for the insufficiency and impossibility of extending terrestrial conceptions of politics to Mars, the planet most often subjected to expansionist fantasies.⁷⁸ Valentine contends that when humans attempt to project political formations such as capitalism, socialism, or settler-colonialism onto a possible Martian settlement, they fail to acknowledge that these phenomena depend on specific configurations of material conditions that 'cannot travel beyond Earth as cargo.'⁷⁹ Not only is the Martian ground fundamentally incompatible with terrestrial life, but even the building materials found on Mars defy world-making practices by Earthlings.

The stakes are high, as terrestrial modes of political thinking are not only incompatible with an extraterrestrial world, but they are potentially deadly. As soon as conditions for human habitability are not present, such as on Mars, any form of action becomes immediately and fundamentally connected to survival. Any Martian settlement 'would need to incorporate relations among physics, potential human conflict, energy needs, and unanticipated interactions with microbes or Mars's persistent chemistry'.⁸⁰ These fragile relations, Valentine emphasises, are vital: 'Crucially, *any* failure, relation, mistake, or unforeseen problem in *any* of those relations at *any* scale could end the *entire world* for everyone and everything within its boundaries because of Mars's incompatibilities with terrestrial forms of life.'⁸¹ Other celestial bodies beyond Mars, with their specific physical and geological conditions, will bring their own unique challenges. Extraterrestrial spaces are not blank canvases for the human imagination, as they all provide distinct challenges to terrestrial political orders.⁸²

This is important because it provides a starting point for theorising the politics of outer space as more than a mere extension of Earthly politics. In theorising outer space as a mirror image of Earthly politics, we lose sight of the significance of outer space as a very particular environment, one that undermines most human attempts at world-building due to the absence of habitable conditions. Aside from seeing spacefaring as a more-than-human endeavour, which is dependent on the agencies of non-human beings, materials, and technologies, it also entails navigating anti-human forces and elements, that is, forces and elements that are deadly to humans and destructive to their technologies. As in the Arctic, challenging environmental conditions do not eliminate but transform the possibility and conduct of politics. The further we move away from Earth's most densely populated zones of human habitation, the more challenging it becomes to sustain dominant political forms, and the more urgent the grappling with different material conditions. These material conditions challenge and transform the conduct of politics as developed on Earth. This raises new questions that cannot be answered by bringing extraterrestrial environments into the fold of IR's theoretical apparatuses, but by provincialising the terrestrial grounds of political practices and ideas.

In outer space, human habitability therefore cannot be taken as a given but becomes a highly fraught and tenuous achievement, demanding all kinds of technological and political innovations. Because of the vulnerability of human-built technological systems and relational networks of life forms in space, any kind of political order is a unique, risky arrangement. Consequently, in off-Earth environments, no entity, force, or agent, including the human, can claim a privileged or ontologically secure status.⁸³ As Valentine contends, theoretical frameworks from Earth that emphasise the agency of non-human actors are insufficient in comprehending this unique 'alien relationality', formed in the absence of familiar terrestrial conditions.⁸⁴ Political arrangements in space stations and settlements will necessarily be shaped by this alien relationality and thus take up

⁷⁸David Valentine, 'Provincializing Earth: Grounding and writing acknowledgments from otherwheres in the cosmos', in Istvan Praet and Perig Pitrou (eds), *Social Sciences off Earth: An Introduction to Outer Space Studies* (Oxford: Oxford University Press, forthcoming).

⁷⁹Ibid., p. 5.

⁸⁰Ibid., p. 11.

⁸¹Ibid., p. 12.

⁸²Ibid., p. 12.

⁸³Ibid.

⁸⁴Ibid.

unfamiliar forms. Even more ‘distant’ modes of engagement with outer space, from space resource extraction to space security, are also unlikely to produce an extension or logical conclusion of human history and politics as it has emerged on the habitable surface of planet Earth, as the material conditions of space demand that these phenomena manifest differently.⁸⁵ Indeed, as James Clay Moltz has argued, the material circumstances of space environments compelled a process of ‘environmental learning’ throughout the Cold War, whereby the United States and the Soviet Union adapted repertoires of security due to the heightened dangers of radiation effects and orbital debris.⁸⁶

Bringing this back to debates on planetary politics, we can similarly see Earthly habitability as a specific and highly vulnerable outcome of geological, biological, and ecological processes, especially as they intersect with more-than-human agencies. Even when situated within the so-called Goldilocks zone, the narrow region around the sun in which conditions are ‘just right’ for temperatures to be moderate and for liquid water to exist, human habitability is a rare occurrence.⁸⁷ ‘You have to remember that oxygen was toxic for the first creatures,’ states Dipesh Chakrabarty.⁸⁸ The first mass extinction of species occurred when a photosynthesising bacterium appeared and released high levels of oxygen into the atmosphere.⁸⁹ Therefore, ‘if you look at the story of the oxygen in the air from our point of view, it’s a blessing, but if you look at it from the point of view of bacteria that subsisted mainly on nitrogen, it was a [catastrophe].’⁹⁰ The historicity and uniqueness of human habitability is especially important to recognise in the face of fears of an ‘uninhabitable Earth.’⁹¹ As recent Intergovernmental Panel on Climate Change projections estimate that the habitability of parts of the planet will be severely threatened within this century due to rising temperatures, flooding, and sea-level rise, human habitation gains an increasingly central stage in political thought and action.⁹²

For IR theorists, we would therefore like to end with the provocation to further interrogate, rather than taking for granted, the politics of human habitation. Instead of assuming that politics works a particular way regardless of physical circumstances, we encourage thorough theorisation of how human habitability is created, maintained, and undermined through concrete political practices – and for which particular groups of humans. This includes studying politics in places that are increasingly on the fringes of human habitability due to anthropogenic climate change, but also spaces that have historically been situated outside of the established zones of human habitation but are brought into the realm of human influence, such as off-Earth environments. Across these locales, we are confronted with material environments, forces, and conditions that evade and escape human domination, and which are ‘rebellious against the assemblages that seek to contain it.’⁹³ In laying the groundwork for the theorisation of outer space, we situate its politics precisely at the point where histories of more-than-human action and these material forces meet.

Concluding remarks

Space is potentially infinite, but the potential for the humanisation of outer space is not. In this article, we have explored the prospects for IR theory to take some tentative steps into outer space,

⁸⁵David Valentine, ‘Exit strategy: Profit, cosmology, and the future of humans in space’, *Anthropological Quarterly*, 85:4 (2012), pp. 1045–67.

⁸⁶James Moltz, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests* (Palo Alto, CA: Stanford University Press, 2011).

⁸⁷Leonard Mlodinow and Stephen Hawking, *The Grand Design* (New York: Random House, 2010), p. 153.

⁸⁸Dipesh Chakrabarty and Ashish Ghadiali, ‘On the idea of the planetary’, *Soundings*, 78:78 (2021), pp. 50–63 (p. 52).

⁸⁹John B. West, ‘The strange history of atmospheric oxygen’, *Physiological Reports*, 10:6 (2022), pp. 1–4.

⁹⁰Chakrabarty and Ghadiali, ‘On the idea of the planetary’, p. 53.

⁹¹David Wallace-Wells, *The Uninhabitable Earth: A Story of the Future* (London: Penguin, 2019).

⁹²Hans-Otto Pörtner, Debra C. Roberts and Melinda Tignor *IPCC Climate Change 2022: Impacts, Adaptation, and Vulnerability* (Cambridge: Cambridge University Press, 2022).

⁹³Frédéric Neyrat, ‘What is Alienocene?’, available at: {<https://alienocene.com/what-is-alienocene/>}.

and the forms of theoretical understanding that are opened by these ventures. Contributing to ongoing attempts to theorise international relations through ‘planetary’ conceptions of politics, we have sought to open up lines of inquiry that stretch beyond the edge of our home planet. In particular, we have demonstrated that efforts to move IR theory beyond its flat-Earthist origins have the potential to bring into view new vertical forms of political power. Using the example of anti-colonial theory, we have explored how making IR theory three-dimensional can extend and nuance our understanding of the spatial characteristics of power dynamics and relations. Using the empirical illustration of the Bogotá Declaration, we showed how neo-colonial domination and resistance may take on new geometries and territorialities in outer space.

At the same time, our exploration of human habitationism and our efforts to think through this problem expose the very hard limits of the fantasies that suggest that Earth-level politics can simply and inevitably be lifted vertically up in the air, while also clarifying how habitability has always been hiding at the core of our understandings of politics. In contrast to common claims, and drawing on materialist thinking, we have made the case that it is insufficient and inaccurate to assume that terrestrial politics can simply be extended to extraterrestrial spaces if space advocates so desired. While Earthly forms of domination inform the visions and practices of space exploration, they run up against the limits of survival once humans and other species enter space. Beyond Earth, as well as in some extreme terrestrial environments, humans become fundamentally dependent on the technologies and non-humans that accompany them. A departure from the zones of human habitation therefore necessitates unique and risky political formations, and these political phenomena can better be understood by reorienting our terrestrial modes of theorising.

The goal of this piece has primarily been to expose the problems inherent in terrestrial assumptions and suggest the theoretical value involved in moving beyond them for particular lines of inquiry. However, we would also like to take this opportunity to suggest how scholars might seek to extend our theoretical understanding of space by actively researching outside the constraints of this limiting assumption. In our assessment, the most fruitful form of endeavour would be to ask more precisely how missions to extend humanity into outer space seek to overcome the constraints on habitability that we have identified, and what forms of domination these methods either explicitly warrant or indirectly anticipate. We believe that these are precisely the questions confronting scientists, engineers, designers, entrepreneurs, and public policymakers daily, as they work towards the goals of establishing a space station on the Moon, sending a mission to Mars, or even launching satellites into the Earth’s orbit. In developing practical answers to these problems, a variety of ‘experts’ are inventing the politics of outer space on the fly. Whereas much of this work goes unnoticed by IR theorists, there are already ongoing debates on the international politics and ethics of these developments. In journals such as *Space Policy* and *Astropolitics*, we find evidence of long-standing and principled discussions among scholars and practitioners about space militarisation, the extraction of resources on celestial bodies, and the need for environmental protection beyond Earth.

We believe it is essential that theorists within IR and its cognate disciplines become directly engaged in these discussions – as they are being decided within organisational settings that have the power to shape practices on the ground – to uncover the politics of space exploration and its most harmful manifestations. While we have argued for a renewed theorisation of the politics of outer space, we also wish to advocate for more empirically grounded approaches to space exploration, space science, and the space industry. We believe that such empirical work would constitute further grounds from which to bring into view the dangers and limits of space exploration endeavours, from space militarisation to space colonisation, and their dominant imaginaries. This entails not only engaging with existing space plans, but also connecting this research to budding examples of anti-colonial and environmental critiques in practice. Instead of staying silent on the momentous developments we are witnessing in outer space, or of reproducing the constitutive logics of these endeavours, this allows us to study and debate our relationship with outer space. This work entails a voyage not necessarily out to space itself (indeed, we could debate if and how going to space is

even desirable) but into the heart of our own terrestrial consciousness, with its Earthly assumptions, priorities, and limits.

Video Abstract. To view the online video abstract, please visit: <https://doi.org/10.1017/S0260210524000184>.

Acknowledgements. This project was generously supported by the Fair and Resilient Societies Theme Based Collaboration Programme at the University of Amsterdam. Earlier versions of this article benefited from discussions at EISA 2023 and the University of Amsterdam's Program Group in Transnational Configurations, Conflict and Governance. We would especially like to thank the editors and anonymous reviewers of *RIS* and Benjamin de Carvalho, Anja Karlsson Franck, Polly Pallister-Wilkins, and Elisa Schramm for their helpful comments and suggestions. Nathalie Lai and Thao Pham provided invaluable research assistance in developing our wider research agenda on 'Decolonial Space'.

Enrike van Wingerden is a lecturer and researcher at the University of Amsterdam and the Erasmus University Rotterdam. Her research is centred on the international relations between societies, environments, and technologies in the (post-)colonial world. She is involved in interdisciplinary collaborations with artists and designers and coordinates projects on 'Climate Change and Displacement' and 'The Politics of Satellite Infrastructure'.

Darshan Vigneswaran is Associate Professor at the Department of Political Science, University of Amsterdam. He is Senior Editorial Fellow at the journal *Migration Politics* and Senior Researcher at the African Centre for Migration and Society, WITS University. His research lies at the intersection of International Relations and Political Geography, and he leads research projects on 'Migration Politics in the Global South' and 'Decolonizing Outer Space'.