Article

Society and Space

EPD: Society and Space
0(0) 1–18

DOI: 10.1177/0263775820953855
journals.sagepub.com/home/epd


Being earthbound: Arendt, process and alienation in the Anthropocene

Oliver Belcher and Jeremy J Schmidt
Durham University, UK

Abstract
Hannah Arendt developed a twofold account of 'being earthbound' directly relevant to Anthropocene debates regarding the political. For Arendt, both senses of 'being earthbound' arose as humans began to act into nature, not merely upon it. The first sense is oriented to a political ontology of process, which arose as human actions – political, technological, scientific – nullified modernist conceits separating humans from nature. The second sense is one of earth alienation, which is referenced specifically to a scientific praxis coincident with advances in science and technology that alienates common sense experiences in politics. Though not unqualified, these two senses of being earthbound anchor our argument that Arendt offered prescient resources for understanding the political in the Anthropocene at the intersection of science, capital and world. The article ends by contrasting Arendt's account of being earthbound with Bruno Latour's recent interventions on the politics of Gaia.

Keywords
Arendt, Anthropocene, process, alienation, action

Introduction

In May 2019, the Anthropocene Working Group (AWG) voted to treat the Anthropocene as a 'formal chrono-stratigraphic unit' by a margin of 29 to 4. The same tally carried a second vote to use 'stratigraphic signals around the mid-twentieth century' as the primary marker for the 'base of the Anthropocene'.[1] For those following debates over human impacts on the Earth system, the vote was unsurprising. In 2015, the AWG argued a mid-20th century start date was optimal and identified the 'artificial radioisotope' signal of atomic bombs as a potent stratigraphic signal of the Anthropocene (Zalasiewicz et al.,

Corresponding author:
Jeremy J Schmidt, Department of Geography, Durham University, Lower Mountjoy, South Road, Durham DH1 3LE, UK.
Email: jeremy.schmidt@durham.ac.uk

2015: 201). In 2016, the AWG recognized the stratigraphic and functional distinctiveness of the Anthropocene, and presented evidence and recommendations to establish it as a geological time unit at the *35th International Geological Congress* (Waters et al., 2016; Zalasiewicz et al., 2017). Earth system scientists have long argued that the coincidence of various geological signatures – fly ash, radionuclides, plastics, greenhouse gas concentrations – with anthropogenic impacts has forced the Earth system into a 'no-analogue' state (Steffen et al., 2004). For social scientists, this no-analogue state is pregnant with political implications as signs referencing industrialism, colonialism, Indigenous genocide, plantation slavery, nuclear energy and capitalism each articulate differently – if often relatedly – with the unequal social conditions driving planetary forcing (Davis and Todd, 2017; Haraway, 2016; Lewis and Maslin, 2018; Moore, 2015; Yusoff, 2017, 2019). In this context, the votes cast by AWG members not only entangle science with politics, but they also point to debates over the political itself.

Four decades before the Anthropocene entered academic discourse, Hannah Arendt made a provocative inquiry into the scientific and political implications of human impacts on the Earth. In this article, we argue that Arendt's account provides critical resources for engaging debates over 'the political' in the Anthropocene. The political is not, of course, a neutral ground where differing views jostle for influence. Rather, it is shaped by contests over who and what participates and matters in politics itself (Machin, 2019; Mann and Wainwright, 2018). Our entry point is Arendt's (1958a) volume *The Human Condition*, which is often read, correctly, as a meditation on the conditions of possibility for political action as a vitalizing practice set amid her concerns over the alienating experience of 'the social' (Canovan, 1994; Dikeç, 2013; Owens, 2012; Pitken, 1998). What has often passed unnoticed about the book, however, is that Arendt (1958a: 3) foregrounds humans as fundamentally 'earth-bound creatures'. As we argue, an overarching theme of *The Human Condition* is to draw out the implications of being earthbound in light of capitalism, modern science and technology (particularly nuclear technologies). As we show, Arendt's analysis of the entanglements among science and politics in the modern world bears directly on debates over the political in the Anthropocene. More than this, it is pertinent to contests over 'being earthbound' within it (Danowski and Viveiros de Castro, 2017; Latour, 2017, 2018).

This article has five sections. 'Anthropocene conditions and the political' situates Arendt's argument in *The Human Condition* within her oeuvre and amid contemporary debates over the Anthropocene. According to Arendt (1958a), a novel feature of the 'modern world' is the human capacity to not merely of act upon nature, but act *into* it. 'We have begun', Arendt (2006: 58) wrote, 'to act into nature as we used to act into history'. Such turns of phrase are not cherry-picked quotes. Rather, they characterize the ethos of *The Human Condition* and Arendt's later writings in ways that provide a rejoinder to critics who dismiss Arendt as anthropo- or socio-centric (e.g. Connolly, 2017; see below). They also provide resources for generative engagements with how Arendt reworked the boundaries distinguishing the fundamental activities of labour, work and action – the triad anchoring what she calls the *vita activa*. This triad of activities comprising the *vita activa* corresponds to the human condition across the domains of life (labour), worldliness (work) and politics (action). Furthermore, Arendt's insights on humans acting into nature anticipated a now familiar axiom of the Anthropocene: that human and geological times intersect (Chakrabarty, 2009).So situated, Arendt's (1958a) diagnosis of the 'transformation of mankind' is linked to the transformations wrought by acting *into* nature under the dual pressures of capitalism and technoscience. Together, these alter the terrain of the political by transforming what it means to be earth-bound creatures.

'A political ontology of process' and 'Earth alienation' examine, respectively, how Arendt (1958a, 2005) developed two senses of 'being earthbound' that make the political coordinate to capacities of acting into nature. The first sense of 'being earthbound' is marked by an ontological shift away from phenomenological accounts referenced to 'being' – in which nature and things are treated as an ontic realm separate from action – to a political ontology of *process*. Here, Arendt asks how politics are altered by the capacity to channel forces happening only elsewhere in the universe, like nuclear fusion, into earthly processes. For Arendt, understanding the political ontology of process requires tracking the transformations that enable action *into* nature across collisions of capital, science and technology. The second sense of 'being earthbound' is referenced to scientific praxis and, more specifically, to what Arendt identifies as 'earth alienation'. In contrast to (but not in conflict with) Marxist accounts of the alienation of labour, Arendt identifies how the disclosure of the Earth through the multiplicity of scientific praxis created new conditions of political alienation. No longer is politics anchored by common sense experience and the plurality of ways individuals encounter reality, for the experiential disclosure of the social and natural world is always already *mediated* by technoscience. These two senses of being earthbound led Arendt (1963a: 527) to renounce not only anthropocentrism but, more radically, 'all anthropomorphic elements and principles, as they arise either from the world given to the five human senses or from categories inherent in the human mind'. This form of *non*-anthropocentrism poses acute difficulties for the political, because the plural perspectives through which the reality of the social world is understood must all travel in single file: through forms of science and technology that disclose the world through instruments and techniques that bring universal processes into earthly affairs.

Finally, 'Being earthbound in the Anthropocene' returns to intersections of science, politics and the *geo*political concerns of the Anthropocene (e.g. Belcher et al., 2020; Clark and Yusoff, 2017; Dalby, 2020; Johnson et al., 2014). There, we heed Honig's (1993: 121) admonition that, while not everything is political for Arendt, nothing is 'ontologically protected' in the transformation of the human condition she examined. In this spirit, we contrast Arendt's notions of being earthbound against proposals by Latour and Lenton (2019; cf. Lenton and Latour 2018), who mobilize Gaia to ground political freedom. Latour and Lenton (2019) reject the form of Earth system science (ESS) that made possible the explanation of Anthropocene (cf. Schellnhuber, 1999; Steffen et al., 2004). For Latour (2018: 59), the force of Gaia reorients planetary politics such that it 'hardly matters' whether industrialism or colonialism were good or bad. By contrast, Arendt suggests a route that stays with both the science *and* the intersecting, alienating violences of industrialism, colonialism, and capital. In Arendt's account, modern sciences are constitutive of the political. Likewise, we argue, ESS cannot be set aside in accounts of the political any more than industrialism or colonialism can be waved off in votes connecting sign and function to mark the Anthropocene.

Anthropocene conditions and the political

Writing of the political challenge of the Anthropocene, Clark (2014: 28) argues that the magnitude of forces at work transforming the Earth system have the 'capacity to undo the political' owing to their potential to annihilate 'political beings themselves'. Clark, citing Honig (2009: 28), restates the challenge as a matter of synchronizing contemporary politics with inherited political and geological histories. Likewise, Chakrabarty (2016) worries inherited political terms once anchored within the human/nature dualism, such as liberal freedom, turn out to be fables when that dualism collapses in the Anthropocene. In her own

manner, Arendt (2005: 145) foresaw the depth of the challenge of the planet altering forces of capitalism, science and technology when she wrote that

> there is hardly a single political category or a single political concept that has been passed down to us that, when measured against the [possibility of the atomic end to all organic life], does not prove theoretically obsolete and practically inapplicable.

Even though Arendt shared many of the sentiments of her post-WWII contemporaries, who expressed anxieties over the effect of science and technology on planetary and human affairs (Greif, 2015), she nevertheless formulated a distinctive take on the political that did not reject the scientific ethos, which opened room for new political categories and concepts attuned to a scientifically-informed 'being earthbound'. That is, Arendt considered science politically, as a domain of human action, while remaining alert to its tendency towards the 'technical colonization of society' (Lazier, 2011: 604).

Arendt wrote *The Human Condition* as preparations were under way for the International Geophysical Year (1957–1958), and she opened the book 'with a critique of Sputnik, the best-known IGY project' (Goossen, 2020: 157). Throughout the 1950s, 'big science' took shape through geophysical techniques that termed what we now call 'anthropogenic' forces as 'artificial' phenomena, such as the 'artificial radiation' of atomic bombs, the 'artificial burning' that pumped CO_2 into the atmosphere, and Sputnik, the 'artificial satellite' in Earth's orbit (Goossen, 2020). To get political traction on how 'artificial' phenomena simultaneously transformed nature and the human condition, Arendt distinguished the modern age from the modern world. Arendt wrote (1958a: 6),

> [T]he modern age is not the same as the modern world. Scientifically, the modern age which began in the seventeenth century came to an end at the beginning of the twentieth century; politically, the modern world, in which we live today, was born with the first atomic explosions.

Arendt was no stranger to bold theses, yet references in *The Human Condition* to how the modern world arose at the intersection of human artifice that transformed nature by acting *into* it have not been as thoroughly engaged as her more well-known diagnoses; e.g. how totalitarian violence produced statelessness in ways that revealed 'the right to have rights', or how modern notions of political revolutions were distinct by virtue of instantiating new social orders rather than restoring old ones (Arendt, 1958b, 1963b, 1972, 1994). These and other arguments by Arendt have proved generative for scholarship on feminism, post-colonialism, race, and the relationship between democracy and emergency (Benhabib, 1993; Canovan, 1994; Chakrabarty, 2012; Honig, 2009; Wolfe, 2002). Given the AWG's preference for the 'artificial radioisotope' signal to mark the new epoch, and its implications for the political, *The Human Condition* stands amidst Arendt's broader oeuvre as an untapped resource for understanding the political as shaped by 'artificial' (i.e. anthropogenic) forces that act *into* nature.

The political stakes of crossing from what Arendt called the 'modern age' to the 'modern world' revolve on the politics of 'worldliness' itself. We argue that Anthropocene scholarship can think productively with Arendt with regard to worldly, 'political matter', and the role of non-human things affecting the political (cf. Braun and Whatmore, 2010). Honig (2017), for instance, reinvigorates the centrality of 'things' in Arendt's account of the modern world. It is a well-known aspect of Arendt's (1958a: 52) thought that 'to live together in the world means essentially that a world of things is between those who have it in common, as the table is located between those who sit around it'. For Arendt, things

provide permanence to the social world. By rethinking the function of things, Honig (2017: 34) makes the case that Arendt is a kind of 'object-relations theorist' who recognized the capacity of 'things' to stabilize the world. The troubling corollary, however, is that the novel capacity of atomic weapons meant some 'things' could destabilize – that is, end – the conditions by which any world is made permanent. Honig's argument for the centrality of 'things' contrasts with Last's (2017: 74) view that Arendt tolerates things, but generally 'has a very negative attitude towards the encroachment of matter on human affairs'. There are reasons to follow Honig in this instance. First, as Hyvönen (2016: 545, original emphasis) shows, Arendt's concern was with how the '*thingly* character of the world' was under threat by accelerating material forces of science, technology and capital. Second, as Schmidt (2017) shows, Arendt's attention to things offers a way to arrest the 'naturalization of process' in which non-human agency, such as that of water, has been manipulated to link geology and liberal governmentality in the Anthropocene. As discussed below, Arendt placed particular emphasis on how the materiality of the world is transformed by capitalist processes and, with it, the terms of political governance.

Honig's call to recognize the constitutive role of 'things' contrasts with political theorists who dismiss Arendt as irrelevant to understanding the political entanglements between human and non-human action. Bennett (2010: 34) criticizes Arendt for positioning humans as the 'bearer of an exceptional kind of power' that excludes non-human actions and their political implications. Connolly (2017) groups Arendt with other 'sociocentric' thinkers who disregard the intrusions of non-human processes and forces within and beyond human worlds. There are important rejoinders to these critiques. Principal among them is that process, the register Bennett and Connolly respectively mobilize, is what they overlook in Arendt, who employed process to connect Earth and human histories with scientific explanations of earthbound conditions. For Bennett (2010: 33), explaining emergent causality demands treating 'process as itself an actant'. For Connolly (2017), process is central to accounts of emergence. Arendt (1958a: 296) was alert to the importance of process and honed her arguments in view of the ontological questions at stake when, 'In place of the concept of Being we now find the concept of Process'. Indeed, Arendt (1958a: 232) understands human action as process:

> The central concept of the two entirely new sciences of the modern age, natural science no less than historical, is the concept of process, and the actual human experience underlying it is action. Only because we are capable of acting, of starting processes of our own, can we conceive of both nature and history as systems of processes.

An adequate appraisal of Arendt requires engaging her account of process, an ontology no more natural than those of 'being' it displaced.

Arendt's account of 'the' modern world is also salient to work on regarding multiple worlds in the Anthropocene (de la Cadena and Blaser, 2018). Although Parr (2018) and Yeatman (2015), respectively, find resources in Arendt's account of action for confronting the depoliticization of the Anthropocene, it is necessary to further examine her account. For instance, Arendt's connection of the exceptional force of atomic weaponry, and the confluence of capitalism and technoscience that makes it possible to act *into* nature, speak directly to Anthropocene scholarship rethinking politics across geological, political, social, non-human and planetary life (Clark and Yusoff, 2017; Dalby, 2020; Latour, 2017; Swyngedouw and Ernstson 2018). Especially important is what Skrimshire (2019: 72) described as Arendt's insight that changing relationships to things entailed that 'modernity became a vision of the human as earthbound in its own world'. This internally facing gaze

presents a familiar normative concern: that interpretations of the Anthropocene take actions by one set of social actors as overdetermining all other forms of social or political life (Schmidt, 2019). This is not quite Arendt's target; hers is about the impossibility of anchoring the political in the permanence of the world owing to things (e.g. atomic weapons) capable of rendering it impermanent. This does not displace concern with the violence of industrialism, colonialism or capitalism. Rather, it adds to them by entangling science with the political, from extraction and trade of the raw materials for nuclear technologies through to their use in the co-production of climate science (Edwards, 2012; Hecht, 2012). Indeed, Arendt argued that technoscience did not make a new 'nature' but rather exhibited capacity for 'starting natural processes which would not have come about without human interference' (Arendt, 2006: 58). For Arendt, the open-ended, irreversible aspects of these new processes rendered scientific action both like and unlike political action generally. Like action, atomic science and technology created 'an endless chain of happenings whose eventual outcome the actor is utterly incapable of knowing or controlling beforehand' (Arendt, 2006: 58). Unlike action as previously understood, science disclosed forces that could undo the political in ways that affected the condition of being earthbound.

A political ontology of process

'Process' is ubiquitous across efforts to preclude dualisms parsing humans from non-humans in the Anthropocene (Chakrabarty, 2014; Clark and Yusoff, 2017; Haraway, 2016; Moore, 2015). Yet, the politics of process are often left unaddressed. Even in works that nod to Arendt (e.g. Swyngedouw and Ernstson, 2018), process figures as a site of conceptual and material alignments rather than a political register. Here we consider Arendt's political ontology of process. Arendt drew explicitly on Whitehead's (1957: 53) claim that 'nature is a process' to situate human time with respect to the non-human, or what Whitehead termed the 'passage of nature'. In this regard, Arendt had two aims that cut across this section: (1) to give an account of how the natural sciences internalize the notion of process as they take on historical valence, and (2) to identify how the ontology of process must be understood as no more natural than the fixed ontology of 'being' it displaces. At this intersection, Arendt (1958a: 6) confronts the end of the modern age – the end of the nature/society dualism that took root with the rise of natural sciences in the 17th century – and contrasts it to the modern *world* 'born with the first atomic explosions'.

Arendt (1958a) developed her view by drawing on Whitehead's break with analytic philosophy and his embrace of process. This proved instructive in two respects. First, it signalled that

> objects of knowledge can no longer be things or eternal motions but must be processes . . . the object of science therefore is no longer nature or the universe but the history, the story of coming into being, of nature or life or the universe. (Arendt, 1958a: 296)

This shift in understanding from a static and formal natural order of being to processes of becoming was anticipated, in Arendt's view, by 19th century turns to history across numerous sciences, such as geology, biology and anthropology. Following Whitehead, Arendt (1958b: 137) argued that the essential feature of process as the basis of reality is that it 'has no end or aim but itself'. Second, since 'being' was no longer the stable 'in-itself' of an object that remained separate from its phenomenal appearance, practices of scientific experimentation premised on that form of ontological stability required revision. The nature of things *qua* process now 'derived their significance and meaning solely from their functions in

the over-all process' (Arendt, 1958a: 296). In other words, science discloses 'happenings' in processual time rather than revealing (stable) being. Arendt (1958a, 2005) refers to this overall process as the 'web of relationships' entangling society *and* nature.

In the modern world, process encompassed the overall conditions of possibility for understanding natural and social realms. Arendt argued that process took hold as the key political register as the modern age gave way to the modern world because the latter's processual and accelerating permutations (i.e. productivity, growth, development) undermined a sense of permanence in the world. For instance, Arendt (1958a: 105) identified the 'hitherto unheard-of process of growing property, [and] growing acquisition' that had become an object of inquiry for 17th-century political theorists, particularly Hobbes. It was in that historical moment, Arendt (1958a: 105) argued, when the 'crudest superstition of the modern age – that "money begets money" – as well its sharpest political insight – that power begets power' that the concept of process emerged as the key register of the modern age.[2]

This historical juncture prompted Arendt to articulate a political ontology of process by mobilizing her distinctions among labour, work and action to consider how accumulative processes ultimately undermined the permanence of the modern age – the presumption that accumulative processes would expand endlessly. Arendt's starting point is to treat *labour* as constrained to biological activities of subsistence, reproduction and survival. Labouring activities are those that result in no permanent changes to Earth processes; a field left uncultivated will eventually re-wild according to independent processes of nature, to use one of her examples. This is not the same as claiming that, left untended, fields return to an original state. Nature for Arendt is process, not being. From Arendt's (1958a: 150) standpoint, nature cannot 'make' things that outlast itself precisely because everything in nature is 'self-identical with the process through which it comes into being'.

In contrast to labour, *work* is the fabrication of artefacts (including the built environment) made by humans. Arendt's view of the working subject, *homo faber*, is used by Szerszynski (2012) to consolidate her contribution to the Anthropocene, but this view proves too constraining as we show. For Arendt, work produces objects that, by virtue of their permanency, constitute the world by functioning as common furniture – things – for human experience and meaning (Oliver, 2015). Arendt refers to this common world as the 'human artifice'. In the modern age, the (biological) labour of the human organism was reincorporated into natural processes, while the world corresponded to the durable works of *homo faber*. Here Arendt (1958a: 137) draws on Heidegger (1971) to argue that the world has no 'sublime indifference of an untouched nature' but is instead made through the 'environment of nature'. Arendt (1958a: 148) described the activity of work as one that 'denaturalized nature for our own worldly ends'. That is, *homo faber* conceives of ends to pursue and denaturalizes nature by making a permanent environment for the social world: wood into tables, stones into cities, petrochemicals into plastics, and so forth. For Arendt, however, the durability of the world underwent immense transformations over the *longue dureé* of the modern age and was undercut entirely with the onset of the modern world.

Arendt assembles her account of the transformations entailed by the modern world in ways too numerous to rehearse here. What interests us is how and why *homo faber* was viewed unfit for navigating the political in the modern world. Arendt's account begins in terms congruent with Marx, identifying how the expropriation of peasants from the land, in Europe and the colonies, was a precondition for labour power under capitalism, and subsequently for the form of alienation induced by 'naked exposure to the exigencies of life' of those working in mines and factories (Arendt, 1958a: 255). The outcome of colonialism and industrial capitalism, however, was not a durable world produced by *homo faber*. Rather, Arendt (2005: 157) pointed to the emergence of a consumer waste economy which

accelerated as it matured through the 'rape of nature'. Under a capitalist mode of production, the activity of *homo faber* was no longer confined to making a permanent world of durable objects akin to the pre-capitalist artisan. Rather, accumulation accelerates such that the productive activity of *homo faber* is fed back into the process of wealth accumulation itself. The emergence of labouring classes and consumer society rely on the powerful activity, articulated by Marx, of metabolizing the raw materials of nature and bodily capacity into social (re)production. For Arendt, understanding of the political ontology of process is central to positioning the destabilizing collision of capital, industrialism and technology with transformations to the human condition. Despite her agreement with Marx, she distinguished her view from Marx's (1973: 542) materialist notion that 'man's' goal is one of grasping 'his own history as a *process* and the recognition of nature . . . as his real body;' by which Marx meant the transformative metabolization of nature through its relationship with human labour (Foster et al., 2010). For Arendt, rather than a 'recognition of nature', something novel had been introduced by the human capacity to act *into* nature, and to bring about an intersection of historical and life processes. She drew attention to how the transformation of social reproduction under capitalism undermined the permanency of the social structures through which society metabolized nature:

> Only when wealth became capital, whose chief function was to generate more capital, did private property equal or come close to the permanence inherent in the commonly shared world. However, this permanence is of a different nature; it is the permanence of a process rather than the permanence of a stable structure (Arendt, 1958a: 68–69).

She goes on to describe how the tools used to 'denaturalize nature' in the creation of the human environment reached their outer limit when they began to channel the natural forces 'into the human world' in a way that 'shatter[s] the very purposefulness of the world':

> Today we have begun to 'create', as it were, that is, to unchain natural processes of our own which would have never happened without us, and instead of carefully surrounding the human artifice for defences against nature's elementary forces, keeping them as far as possible outside the man-made world, we have channelled these forces, along with their elementary power, into the world itself. The result is a veritable revolution in the concept of fabrication; manufacturing . . . has become a 'continuous process', the process of the conveyor belt and assembly line . . . For a society of labourers, the world of machines has become a substitute for the real world, even though this pseudo world cannot fulfil the most important task of the human artifice, which is to offer mortals a dwelling place more permanent and stable than themselves. (Arendt, 1958a: 150)

To grapple with human capacities that undercut the permanency of the Earth and of the 'world' presumed upon in the modern age, Arendt mobilized *action* as a field of possibility in which the political may be reconfigured with respect to novelty and process. Influenced by Whitehead and Nietzsche, Arendt positioned her theory of action in reference to process (Villa, 1992). Arendt, however, did not draw an isomorphism between natural and social processes – between 'man' and species-being – as did Marx. Rather, Arendt's (1958a: 7) view was pluralistic, grounded in her claim that 'men, not Man, live on the earth and inhabit the world'. The plurality of action distinguishes it from labour and work in critical ways. Notably, there is no ideal form of action, as may be the case in the designs of *homo faber* according to which a house is made. Whereas work has a beginning and an end, action has beginnings and only unpredictable ends, owing to the introduction of something which has

consequences that cannot fully be anticipated. Action is a process. It takes place in 'webs of relationships' through which individuals disclose themselves to one another in speech and deed (Arendt, 1958a: 183). Action is also irreversible, owing to the impossibility of controlling the effects of an act once initiated into a web of relationships. The 'consequences [of action] are boundless, because action, though it may proceed from nowhere, so to speak, acts into a medium where every reaction becomes a chain reaction and where every process is the cause of new processes' (Arendt, 1958a: 190).

Arendt's political ontology of process anticipates Anthropocene concerns about the 'end of the world' and of technocratic dreams where humans (qua *homo faber*) remake the world (Danowski and Viveiros de Castro, 2017). According to Arendt, *homo faber's* formula for maintaining the 'world' against the elements that break it down is insufficient. Rather, Arendt (1958a: 231) held that the political ontology of process rendered traditional political and philosophical accounts of the world inadequate in view of scientific and technological advances that both disclosed new realities and introduced new processes that affected the formerly stable structures of political life. Thus, the novelty of the modern world was not merely a rearrangement or new 'making' of things. It was the introduction of novel processes *into* both Earth and world: a merger of world and process at the expense of permanence.

The end of the world, in Arendt's (2005) view, is marked by the loss of capacity for action, not the end of 'nature' that coincides with the end of the modern age. Arendt's political ontology of process provided a position in which one novel political outcome of scientific action arose as universal processes from *outside* the earth were channelled into earthly and human affairs. In that moment, the modern age gave way to the modern world; a phenomenon clearly, but not uniquely, on display in the case of atomic power. The exchange of fixed or transcendental categories for those of process meant that sciences premised on the latter also had the potential to undercut the stability of a world of unalterable 'things' produced by *homo faber*. That is, modern science and technology could alter processes themselves. This was profoundly alienating in Arendt's view. 'Only we', Arendt wrote (1958a: 268),

> and we only for hardly more than a few decades, have come to live in a world thoroughly determined by a science and a technology whose objective truth and practical know-how are derived from cosmic and universal, as distinguished from terrestrial and "natural," laws, and which is a knowledge acquired by selecting a point of reference outside the earth is applied to earthly nature and the human artifice.

Moreover, without recourse to metaphysics – to being – the politics of disclosing the human condition in the modern world required a disposition towards the political capacious enough to address technologies that changed the condition of being earthbound.

Earth alienation

For Arendt, scientific practice *qua* action upended the modern age, which gets to the core project of *The Human Condition* regarding how the *vita activa* can no longer be understood through received paradigms of political possibility. Our argument is that necessary to, but often underemphasized in treatments of Arendt, is a second sense of being earthbound. This sense is oriented to scientific and technological praxis. The novelty of Arendt's final chapters in *The Human Condition* on 'Action' and 'The *Vita Activa* in the Modern Age' is how scientific and technological endeavours inaugurate the modern world and, in turn, affect

the conditions of political action. Here, Arendt's commitment to action reveals a double bind. On the one hand, the novel capacity for action in the modern world is the capacity to channel universal forces into the deep rhythms of Earthly processes and human affairs in irreversible and unpredictable ways. On the other hand, action is needed in the form of a remedy that avoids yet further violence entailed by *homo faber's* practices of making. As Arendt (1958a: 238) put it:

> Modern natural science and technology, which no longer observe or take material from or imitate the processes of nature but seem actually to act into it, seem, by the same token, to have carried irreversibility and human unpredictability into the natural realm, where no remedy can be found to undo what has been done . . . [I]t seems that one of the great dangers of acting in the mode of making and within its categorical framework of means and ends lies in the concomitant self-deprivation of the remedies inherent only in action, so that one is bound not only to *do* with the means of violence necessary for all forms of fabrication, but also to *undo* what he has done as he undoes an unsuccessful object, by means of destruction. Nothing appears more manifest in these attempts than the greatness of human power, whose source lies in the ability to act, and without which action's inherent remedies inevitably begins to overpower and destroy not man himself but the conditions under which life was given to him.

In this passage, Arendt anticipates a pressing concern in the Anthropocene: the setting of political possibility between more violently 'making' an environment suitable for humans – denaturalizing nature further such as through geo-engineering – versus identifying an off-ramp to logics of domination (Lövbrand et al., 2010). For Arendt, *homo faber* can only orient the novelty of the modern world towards control over processes. However, if the political is to be configured not only with respect to processes but also to the conditions for affecting life/non-life now evident in capacity for nuclear annihilation, Arendt argues (1958a: 181), then human plurality within the 'web of relationships' through which the common world is disclosed must be oriented to action. The path to this conclusion, however, is not initially heartening. It requires examining Arendt's notion of 'earth alienation', in which the very sciences and technologies that destabilized the modern age are those that disclose the modern world.

Arendt approached alienation in ways shared with other scholars who worried about the effects of scientific and instrumental rationality on politics. What distinguished Arendt is that she demanded science be configured within the political. In this regard, Arendt offers an account of science *as* action, not science in action (cf. Latour, 1987). Central to her account was how the Archimedean view developed by modern science displaced geocentric conceptions of the earth into a universal context. This form of universality was not an abstract view from nowhere; the Archimedean view should not be confused with Haraway's (1988) now famous god-trick. Rather, the Archimedean view was entangled with technologies that displaced the meaning of being earthbound by creating the novel possibility of disclosing Earthly processes from a perspective of the universe – i.e. planetary sciences, the technological view of Earth from space – in ways previously unavailable to human experience.

Arendt (1958a) begins with Galileo's telescope. This technology started to undo the cosmology built between Earth and Sky that governed the western imagination from antiquity to the Renaissance by creating the possibility for a universal science governed by astrophysical laws not originating on Earth. In this sense, the transition from a geocentric to a heliocentric universe presaged a broader form of earth alienation that undercut the embodied sense-experience through which scientific objects were known, such as direct observation or measurement in a laboratory (Arendt, 2006). Instead of the basis for

common sense that developed through the plural perspectives and shared first-person observations of subjects and objects, it was scientific instruments, technologies and abstract mathematical formulas which now provided means of disclosing things and processes that markedly changed the understanding of 'reality' (Daston and Galison, 2007; Jasanoff, 2010).

Arendt (1958a: 262) argued that as instrumental sophistication advanced in physics and mathematics – from atomic acceleration to fantastically more powerful telescopes and the production of new elements – a new form of alienation arose. This form of earth alienation makes the 'discovery of the globe as a whole and the world alienation produced in the twofold process of expropriation and wealth accumulation . . . of minor significance' (Arendt, 1958a: 263). Arendt's style of drawing together insights from thermodynamics and quantum theory may be critiqued for accuracy and historical positioning. But those errors do not undermine her central political insight: that the form of 'universal science' bringing cosmic processes to Earth had novel, transformative effects on the human condition. The consequence of earth alienation was that science – especially nuclear sciences and modern physics – had introduced the possibility that the permanence of the earth was no longer guaranteed. And yet, paradoxically, the only way to understand this transformation was through those same sciences. The upshot, for Arendt, was that these sciences became constitutive of politics in the modern world – a novel, if alienating aspect of the political.

Our goal is not to provide an account of Arendt's philosophy of science (cf. Yaqoob, 2014). Rather, we aim to understand how Arendt treated scientific practice as a novel form of action. When the loss of a common world is coincident with the channelling of universal processes into nature, the effect is a form of earth alienation in which being earthbound is, in practice, no longer constituted through common experience but instead disclosed through sciences and technologies that demand non-anthropocentrism in order to apprehend the role of the universal within the political (Arendt, 1963a).For Arendt, earth alienation required a political response for which *homo faber* was ill equipped. The mismatch arose at the distinction between science as making versus science as action. For instance, writing on physicists involved in the development of nuclear technology, Arendt did not hold in reserve her compunctions about how poorly the political figured in science as making. Rather, the penultimate paragraph of *The Human Condition* holds that scientists have retained the capacity for action because they retain the possibility for bringing novelty into the modern world (1958a: 324). Their practices, however, are directed not to the 'web of relationships' but towards acting *into* nature through making:

> The simple fact that physicists split the atom without any hesitations the very moment they knew how to do it, although they realized full well the enormous destructive potentialities of their operation, demonstrates that the scientist *qua* scientist does not even care about the survival of the human race on earth, or, for that matter, with the survival of the planet itself. (Arendt, 1963a: 536)

The universal perspective created through scientific action transformed what it meant to be earthbound. The atomic detonations of WWII bore shocking witness to this. Advances in modern science, however, have only amplified these challenges through advances in synthetic biology and nanotechnology (Preston, 2018). As Carruth and Marzec (2014) argue, the technologies through which the Earth system is disclosed, such as remote sensing, have stark aesthetic and ethical implications. For instance, reliance on technological instruments may undermine possibilities for the collective witnessing of events from plural perspectives, which Arendt (1982) argued was key to the *sensus communis* of political judgement. Arendt

held that this condition required acknowledging a new form of 'earth alienation' as 'the very quintessence of the human condition' (Arendt, 1958a: 2). As she stated:

> But today we may almost say that we have demonstrated even scientifically that, though we live now, and probably always will, under the earth's conditions, we are not mere earth-bound creatures. Modern science owes its great triumphs to having looked upon and treated earth-bound nature from a truly universal viewpoint, that is, from an Archimedean standpoint taken, wilfully and explicitly, outside the earth. (Arendt, 1958a: 11)

Despite Arendt's indictments of science as making, she does not reject what science discloses. Viewed in this way, *The Human Condition* can be read as taking stock of modern science (Hirsch, 2020); not a rejection of science, but an examination of compounding strains of earth alienation on the political. Understanding how modern science and technology entrain earth alienation within scientific practices of disclosing reality is central to Arendt's project. Science as action views displacement of 'the human' for a non-anthropocentric capacity to take up an Archimedean view *not in abstraction* but through technologies which create new experiences in being earthbound. To 'see' Earth from outer space without ever leaving the planet, for instance, fundamentally alters the collective account of reality in ways no longer anchored in the world of common, sense-experience of merely anthropocentric agents. While science, technology and mathematical thinking are not the *only* ways to disclose 'reality', they enter the ranks of speech and deed as privileged modes of inquiry even as they add constraints to the plural condition of being earthbound in an impermanent world.

Being earthbound in the Anthropocene

When Robert Oppenheimer witnessed the first atomic detonation, he uttered words from the Bhagavad-Gita: 'Now I am become death, the destroyer of worlds'. It was his own translation. As Oppenheimer's biographer notes, the passage is usually translated: 'I am all powerful Time; which destroys all things' (Monk, 2012). The latter is germane to Arendt's (2005: 145) diagnosis of the modern world as a time in which former political categories and concepts prove 'theoretically obsolete and practically inapplicable' owing to things of such power that they can annihilate the political. Arendt's response was to rethink earthbound conditions ontologically, and in scientific praxis, when the political was no longer only earthbound. By the end of *The Human Condition*, Arendt reaches the conclusion that science must be treated as action – a constituent aspect of the political. Yet science was not totalizing. Arendt refused to treat science as making. Logically, she could not, because 'things' science made were no longer a guarantee of permanence, and this fact, as we argued above, marked the arrival of the modern world. Instead, Arendt's (1958a: 7) diagnosis of science as action required a treatment of the implications for plurality; 'to the fact that men, not Man, live on the earth and inhabit the world'. In this conclusion, to distinguish further how Arendt's problematic differs from, and contributes to, Anthropocene scholarship, we contrast it with Bruno Latour's widely circulating account of being earthbound.

Latour's account of being earthbound in the Anthropocene recuperates Schmitt's (2007) notion of 'the political' to distinguish friends from enemies, and to mark the sovereign power of exception regarding life and death. For Latour (2017), Schmitt's distillation of the political as 'friends versus enemies' parallels a distinction between 'the moderns' (those living by the society/nature divide) versus those who are 'earthbound' in the Anthropocene. These enemies now compete for space, territory and soil in which it 'hardly matters' whether industrialism or colonialism were good or bad, because planetary politics are now being

reoriented in an epoch where the Earth itself – Gaia – is a political agent (Latour, 2018: 59). The spatial implication, for Latour, is the reorientation of the political through Gaia as a distributed form of sovereign agency over the conditions of life. To be earthbound, on Latour's view, is to accept Gaia's conditions without, as do moderns, forcing them to comport with the society/nature dualism. Ultimately, however, this leads Latour to reject ESS. The problem with the treatment of Earth as a single, integrated system, according to Latour and Lenton (2019: 676), is that Gaia is not a system whose sum is greater than the parts. Seeking to avoid Haraway's 'god-trick' – the view from nowhere – Latour and Lenton (2019: 676, original emphasis) argue that global views of Earth 'should be resisted because nobody who claims to have "a global view" actually resides *in any real space*'. In their view, Gaia reigns supreme as a distributed sovereign in which 'life forms literally *make their own laws*' not on a globe, but in 'a thin biofilm, a surface' comprising a few kilometres of atmosphere and not 'very far down in the deep earth below' (Latour and Lenton, 2019: 676, original emphasis).

The contrast of Latour's (and Lenton's) views with Arendt, and with positions that stay with ESS, is immediately evident. First, there is a difference. Namely, Arendt recognizes that the laws governing life on Earth are not particular to it; Gaia is not free of the first and second laws of thermodynamics. Second, Arendt's account of how the universal enters politics operates in real space: at the sites where capitalism, technology and science intersect. Her view of science as action contrasts with Latour's well-known view of science in action, where uncovering *homo faber's* purported views from nowhere anchors the task of 'making things public' (Latour and Weibel, 2005). Third, Latour and Arendt both look to human transformations of Earth to diagnose transformations to the political. Despite this similar orientation, they again diverge. Latour (2018) attempts to update Schmitt's (2007) view that the *nomos* of the Earth is grounded in soil by rescaling such laws to Gaia. By contrast, Arendt rejected Schmitt's anchoring of *nomos* in the earth. Indeed, her own reading of Schmitt critiqued his view for locating the source of law in soil, and not in the relations among persons or their rights (Jurkevics, 2017). Latour repeats Schmitt's error when he replaces 'soil' with 'Gaia' in ways that ignore or downplay the violence of European conquest, and the fact that political consent did not travel with colonial expansion (cf. Jurkevics, 2017). This leads Latour to hold the politically obtuse and morally indefensible view that it no longer matters whether industrialism or colonialism were good or bad (Schmidt, 2019). It also dodges a central issue of the Anthropocene, since how scientists connect stratigraphic signs to functional changes to the Earth system is political even by their own account (Waters et al., 2016).

Arendt's view of science as action does not smuggle in the society/nature divide as the problematic of the modern world. That is a distinction of the modern age; an age now past owing to how novel technoscience acts into nature. The *real space* in which such action takes place, Arendt describes as the webs of relationships that constitute earthbound conditions. Here, the things of science matter in ways not captured fully by ideas of 'things' as always and everywhere permanent. Whereas in the modern age novelty was reserved to human speech or deeds (as in ancient Greece), Arendt (2005, 2006) holds that in the modern world *novelty* also includes the acts of science and technology that introduce (novel) processes into earthly affairs. In this way, Arendt treats science *as action*, as *constitutive* of the political. The corollary requirement is accepting responsibility for the form of earth alienation that attends to the scientific disclosure of the earth, and stays with *that* trouble. Further, Arendt recognizes that matter matters politically as the 'things' that anchor the common world are both stabilizing and destabilizing forces on it. Critically, Arendt (1958a) argues that the Earth itself – planetary nature – cannot replace the lost objects that once provided

permanence to the world owing to the capacity for action to render Earth itself impermanent. That is, for atomic bombs to annihilate it.

In terms of practice, Arendt's account of being earthbound leaves the hard work of politics unfinished and open, consistent with her view of action as the capacity 'to begin something new and of not being able to control or even foretell its consequences' (Arendt, 1958a: 235, 2006). This does not relieve scholars who may wish to make use of Arendt of clarifying her relevance to the Anthropocene. For instance, although her arguments regarding race and racism have been constructively engaged in settler colonial and postcolonial contexts (Chakrabarty, 2012; Wolfe, 2002), Arendt herself does not confront the extent of the western political tradition itself in propagating colonial violence. Here, we identify, but do not resolve, two lines of inquiry through which Arendt's alternate diagnosis of transformations to the political prompt considerations for projects that do not abandon the sciences disclosing human impacts on the Earth system, but which also do not constrain politics to them.

The two lines of inquiry Arendt takes up in *The Human Conditions*, those of promise and forgiveness, feature prominently in her attempt to think through being earthbound at the intersection where humans act into nature as they do into history. Both categories are suggestive for thinking about Anthropocene time in reference to action and responsibility owing to Arendt's political treatment of science as action. They are relevant to critical engagements of geology and the Anthropocene, and the question of *for whom* it marks worldly upheaval – which Ghosh (2016) argues is a bourgeois notions of stability built on colonialism, and Davis and Todd (2017) argue may reinforce Indigenous erasure. What if any resources are available in Arendt (2005) given the form of Eurocentrism her work so often reflected? Here, Arendt's critique of science as action is easier to digest than her positive account of what to do next. Nevertheless, as with work on gender, race and postcolonialism that has found constructive dialogue with Arendt, Anthropocene scholarship might also, particularly through her efforts to rethink notions of forgiveness and promise. Arendt (1958a: 236–46) sought to secularize both terms in order to find a language to articulate the profound, planetary changes that western science had wrought from within its own political reserve. Those resources are limited, and part of what motivated Arendt was concern over how to orient the modern world to the irreversibility of past actions and the unpredictability of the future.

For Arendt, forgiveness and promise are forms of political action that do not sacrifice plurality because they require shared practices in a web of relationships. That is, one must enter into political relationship with those from whom forgiveness is sought. There is no singular account of what that entails because plurality cannot be given beforehand; so too for promise. In the modern world, this register spans human and non-human processes, as well as those of industrialism and colonialism from which earth alienation grew out of the alienation of labour. Temporally, a secular orientation to promise contrasts with forgiveness by being a future anterior for action that requires, by virtue of the web of relationships, a commitment to plurality going forward. Indeed, as scholarship attentive to different notions of 'world' suggests, it is critical to think about how divergent political practices are entangled with one another (de la Cadena and Blaser, 2018). What is suggested by Arendt (1958a) is that the modern world – impermanent and novel – necessitates forms of anchoring common experiences that neither deny how acting into nature produces earth alienation, nor which deny that it is only through treating science as politics that plurality in the modern world can be maintained and, with it, the condition for freedom on an earth transformed.

Arendt's account of freedom as the basis of the political is not without challenges (cf. Moten, 2018; Shulman, 2020), but it possesses a different orientation than accounts which collapse the political to life, one that points us towards a pluralistic account of freedom itself – such as those articulated in different legal traditions *for whom* the Anthropocene is not qualitatively new but an intensification of on-going violence (Whyte, 2017). Here we return to the crux of our main argument regarding why Arendt is relevant to the Anthropocene: to treat declarations of the Anthropocene politically requires staying with the science as a constitutive, unavoidable and alienating aspect of earthbound freedom.

Acknowledgements

The authors thank Andrew Baldwin, anonymous referees and the editor for insightful comments and criticisms.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. The vote was recorded on the AWG website: http://quaternary.stratigraphy.org/working-groups/anthropocene/. Last accessed 11 July 2020.
2. Arendt (1958b: 143) credits Hobbes with inaugurating a political ontology in which the 'process of never-ending accumulation of power ' provides the condition of possibility to expand sovereign authority. With Hobbes, process was naturalized to notions of growth, wealth and the development of security for the life of the individual and the state: 'Hobbes's insistence on power as the motor of all things human divine . . . sprang from the theoretically indisputable proposition that a never-ending accumulation of property must be based on a never-ending accumulation of power . . . The limitless process of capital accumulation needs the political structure of so "unlimited a Power" that it can protect growing property by constantly growing more powerful' (Arendt, 1958b: 143).

ORCID iD

Jeremy J Schmidt https://orcid.org/0000-0002-9155-1777

References

Arendt H (1958a) *The Human Condition*. Chicago: University of Chicago Press.
Arendt H (1958b) *The Origins of Totalitarianism*. New York: Meridian Books.
Arendt H (1963a) Man's conquest of space. *The American Scholar* 32(4): 527–540.
Arendt H (1963b) *On Revolution*. London: Penguin Press.
Arendt H (1972) *Crises of the Republic*. New York: Harcourt Brace & Company.
Arendt H (1982) *Lectures on Kant's Political Philosophy*. Chicago: University of Chicago Press.
Arendt H (1994) *Essays in Understanding, 1930–1954*. New York: Schocken Books.
Arendt H (2005) *The Promise of Politics*. New York: Schocken Books.
Arendt H (2006) *Between Past and Future*. London: Penguin Books.

Belcher O, Bigger P and Neimark B, et al. (2020) Hidden carbon costs of the 'everywhere war': Logistics, geopolitical ecology, and the carbon boot-print of the US military. *Transactions of the Institute of British Geographers* 45(1): 65–80.
Benhabib S (1993) Feminist theory and Hannah Arendt's concept of public space. *History of the Human Sciences* 6(2): 97–114.
Bennett J (2010) *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press.
Braun B and Whatmore S (eds) (2010) *Political Matter: Technoscience, Democracy, and Public Life*. Minneapolis: University of Minnesota Press.
Canovan M (1994) *Hannah Arendt: A Reinterpretation of Her Political Thought*. Cambridge: Cambridge University Press.
Carruth A and Marzec R (2014) Environmental visualization in the Anthropocene: Technologies, aesthetics, ethics. *Public Culture* 26(2): 205–211.
Chakrabarty D (2009) The Climate of History: Four Theses. *Critical Inquiry* 35(2): 197–222.
Chakrabarty D (2012) Postcolonial studies and the challenge of climate change. *New Literary History* 43(1): 1–18.
Chakrabarty D (2014) Climate and capital: On conjoined histories. *Critical Inquiry* 41(1): 1–23.
Chakrabarty D (2016) Humanities in the Anthropocene: The crisis of an enduring Kantian fable. *New Literary History* 47(2 & 3): 377–397.
Clark N (2014) Geo-politics and the disaster of the Anthropocene. *The Sociological Review* 62(S1): 19–37.
Clark N and Yusoff K (2017) Geosocial formations and the Anthropocene. *Theory, Culture & Society* 34(2–3): 3–23.
Connolly W (2017) *Facing the Planetary: Entangled Humanism and the Politics of Swarming*. Durham: Duke University Press.
Dalby S (2020) *Anthropocene Geopolitics: Globalization, Security, and Sustainability*. Ottawa: University of Ottawa Press.
Danowski D and Viveiros de Castro E (2017) *The Ends of the World*. Cambridge: Polity Press.
Daston L and Galison P (2007) *Objectivity*. New York: Zone Books.
Davis H and Todd Z (2017) On the importance of a date, or decolonizing the Anthropocene. *ACME* 16(4): 761–780.
de la Cadena M and Blaser M (eds) (2018) *A World of Many Worlds*. Durham: Duke University Press.
Dikeç M (2013) Beginners and equals: Political subjectivity in Arendt and Rancière. *Transactions of the Institute of British Geographers* 38(1): 78–90.
Edwards P (2012) Entangled histories: Climate science and nuclear weapons research. *Bulletin of the Atomic Scientists* 68(4): 28–40.
Foster JB, Clark B and York R (2010) *The Ecological Rift: Capitalism's War on the Earth*. New York: Monthly Review Press.
Ghosh A (2016) *The Great Derangement: Climate Change and the Unthinkable*. Gurgaon: Penguin Books.
Goossen B (2020) A benchmark for the environment: Big science and 'artificial' geophysics in the global 1950s. *Journal of Global History* 15(1): 149–168.
Greif M (2015) *The Age of the Crisis of Man: Thought and Fiction in America, 1933–1973*. Princeton: Princeton University Press.
Haraway D (1988) Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies* 14(3): 575–599.
Haraway D (2016) *Staying with the Trouble: Making Kin in the Chthulucene*. Durham: Duke University Press.
Hecht G (2012) *Being Nuclear: Africans and the Global Uranium Trade*. Cambridge: MIT Press.
Heidegger M (1971) The origin of the work of art. In: *Poetry, Language, Thought*. New York: Harper & Row Publishers, pp.15–86.
Hirsch R (2020) Bounded action: Hannah Arendt on the history of science and the limits of freedom. *Philosophy & Social Criticism* 46(4): 431–451.
Honig B (1993) *Political Theory and the Displacement of Politics*. Ithaca: Cornell University Press.

Honig B (2009) *Emergency Politics: Paradox, Law, Democracy*. Princeton: Princeton University Press.
Honig B (2017) *Public Things: Democracy in Disrepair*. New York: Fordham University Press.
Hyvönen A-E (2016) Invisible streams: Process-thinking in Arendt. *European Journal of Social Theory* 19(4): 538–555.
Jasanoff S (2010) A new climate for society. *Theory, Culture & Society* 27(2–3): 233–253.
Johnson E, Morehouse H, Dalby S, et al. (2014) After the Anthropocene: Politics and geographic inquiry for a new epoch. *Progress in Human Geography* 38(3): 439–456.
Jurkevics A (2017) Hannah Arendt reads Carl Schmitt's The Nomos of the Earth: A dialogue on law and geopolitics from the margins. *European Journal of Political Theory* 16(3): 345–366.
Last A (2017) Re-reading worldliness: Hanna Arendt and the question of matter. *Environment and Planning D: Society and Space* 35(1): 72–87.
Latour B (1987) *Science in Action*. Cambridge: Harvard University Press.
Latour B (2017) *Facing Gaia: Eight Lectures on the New Climatic Regime*. Cambridge: Polity Press.
Latour B (2018) *Down to Earth: Politics in the New Climatic Regime*. Cambridge: Polity Press.
Latour B and Lenton T (2019) Extending the domain of freedom, or why Gaia is so hard to understand. *Critical Inquiry* 45(3): 659–680.
Latour B and Weibel P (eds) (2005) *Making Things Public: Atmospheres of Democracy*. Cambridge: MIT Press.
Lazier B (2011) Earthrise; or, the globalization of the world picture. *The American Historical Review* 116(3): 602–630.
Lenton T and Latour B (2018) Gaia 2.0. *Science* 361(6407): 1066–1068.
Lewis S and Maslin M (2018) *The Human Planet: How We Created the Anthropocene*. London: Penguin Books.
Lövbrand E, Stripple J and Wiman B (2010) Earth system governmentality: Reflections on science in the Anthropocene. *Global Environmental Change* 19: 7–13.
Machin A (2019) Democracy and agonism in the Anthropocene: The challenges of knowledge, time, and boundary. *Environmental Values* 28(3): 347–365.
Mann G and Wainwright J (2018) *Climate Leviathan: A Political Theory of Our Planetary Future*. London: Verso.
Marx K (1973) *Grundrisse: Foundations of the Critique of Political Economy*. Harmondsworth: Penguin.
Monk R (2012) *Robert Oppenheimer: A Life inside the Centre*. New York: Anchor Books.
Moore J (2015) *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. London: Verso.
Moten F (2018) *The Universal Machine*. Durham: Duke University Press.
Oliver K (2015) *Earth and World: Philosophy after the Apollo Missions*. New York: Columbia University Press.
Owens P (2012) Not life but the world is at stake: Hannah Arendt on citizenship in the age of the social. *Citizenship Studies* 16(2): 297–307.
Parr A (2018) *Birth of a New Earth: The Radical Politics of Environmentalism*. New York: Columbia University Press.
Pitken H (1998) *The Attack of the Blob: Hannah Arendt's Concept of the Social*. Chicago: University of Chicago Press.
Preston C (2018) *The Synthetic Age: Outdesigning Evolution, Resurrecting Species, and Reengineering Our World*. Cambridge: MIT Press.
Schellnhuber H (1999) 'Earth system' analysis and the second Copernican revolution. *Nature* 402: c19–c23.
Schmidt J (2017) *Water: Abundance, Scarcity, and Security in the Age of Humanity*. New York: New York University Press.
Schmidt J (2019) The moral geography of the Earth system. *Transactions of the Institute of British Geographers* 44(4): 721–734.
Schmitt C (2007) *The Concept of the Political*. Chicago: University of Chicago Press.

Shulman G (2020) Fred Moten's refusals and consents: The politics of fugitivity. *Political Theory* (early view). Advance online. DOI: 10.1177/0090591720937375.
Skrimshire S (2019) Deep time and secular time: A critique of the environmental 'long view'. *Theory, Culture & Society* 36(1): 63–81.
Steffen W, Sanderson RA, Tyson PD, et al. (2004) *Global Change and the Earth System: A Planet under Pressure*. Berlin: Springer.
Swyngedouw E and Ernstson H (2018) Interrupting the Anthro-obscene: Immuno-biopolitics and depoliticizing ontologies in the Anthropocene. *Theory, Culture & Society* 25(6): 3–30.
Szerszynski B (2012) The end of the end of nature: The Anthropocene and the fate of the human. *The Oxford Literary Review* 34: 165–184.
Villa D (1992) Beyond good and evil: Arendt, Nietzsche, and the aestheticization of political action. *Political Theory* 20(2): 274–308.
Waters CN, Zalasiewicz J, Summerhayes C, et al. (2016) The Anthropocene is functionally and stratigraphically distinct from the Holocene. *Science* 351(6269): 137.
Whitehead A (1957) *The Concept of Nature*. Ann Arbor: University of Michigan Press.
Whyte K (2017) Indigenous climate change studies: Indigenizing futures, decolonizing the Anthropocene. *English Language Notes* 55(1–2): 153–162.
Wolfe P (2002) Race and racialisation: Some thoughts. *Postcolonial Studies* 5(1): 51–62.
Yaqoob W (2014) The Archimedean point: Science and technology in the thought of Hannah Arendt, 1951–1963. *Journal of European Studies* 44(3): 199–224.
Yeatman A (2015) The human condition in the Anthropocene. In: Gibson K, Rose DB and Fincher R (eds) Manifesto for Living in the Anthropocene. Brooklyn: Punctum, pp. 123–126.
Yusoff K (2017) Geosocial strata. *Theory, Culture & Society* 34(2–3): 105–127.
Yusoff K (2019) *A Billion Black Anthropocenes or None*. Minneapolis: University of Minnesota Press.
Zalasiewicz J, Waters CN, Summerhayes CP, et al. (2017) The Working Group on the Anthropocene: Summary of evidence and interim recommendations. *Anthropocene* 19: 55–60.
Zalasiewicz J, Waters CN, Williams M, et al. (2015) When did the Anthropocene begin? A mid-twentieth century boundary level is stratigraphically optimal. *Quaternary International* 383: 196–203.

Oliver Belcher is an assistant professor in the School of Government and International Affairs at Durham University. He is the author of several articles on violence and late-modern warfare, and currently writing a book, *Counter-revolutionary Logistics*, on the history of computation in the Vietnam War.

Jeremy J Schmidt is an assistant professor of Human Geography at Durham University. He researches the social and geological conditions of inequality. He is author of *Water: Abundance, Scarcity, and Security in the Age of Humanity* (New York University Press, 2017).