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*Anthropocene Temporalities and Silicon Valley's Longtermist Scope*

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#### DOI

[10.1177/02632764241240662](https://doi.org/10.1177/02632764241240662)

#### Publication date

2024

#### Document Version

Final published version

#### Published in

Theory, Culture & Society

#### License

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[Link to publication](#)

#### Citation for published version (APA):

Kemper, J. (2024). Deep Time and Microtime: Anthropocene Temporalities and Silicon Valley's Longtermist Scope. *Theory, Culture & Society*, 41(6), 21-36.  
<https://doi.org/10.1177/02632764241240662>

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# Deep Time and Microtime: Anthropocene Temporalities and Silicon Valley's Longtermist Scope

Theory, Culture & Society  
2024, Vol. 41 (6) 21–36  
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DOI: 10.1177/02632764241240662  
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## Abstract

Living in Anthropocene times entails living in relation to two seemingly separate temporalities – the microtime of digital operations and the deep time of geological upheaval. Though divergent, these temporalities are united by their unavailability to perception; microtime proceeds too fast to perceive directly, while deep time is too vast to apprehend. Taking these temporalities as a point of departure, this paper develops three arguments. First, it asserts that the temporalities of deep time and microtime increasingly impact contemporary existence, complicating familiar categorizations of temporal experience. Second, it argues that these ostensibly separate temporalities are ontologically connected through the operations of the tech industry, which is constructing a microtemporal system that extracts the planet's deep time resources to delimit the future both materially and cognitively. Third, it suggests that Silicon Valley legitimizes these processes by funding the philosophy of longtermism, which appeals to distant timescales to marginalize injustices in the present.

## Keywords

Anthropocene, deep time, digital technology, environmental humanities, longtermism, microtime, temporality

The *Clock of the Long Now* is envisioned as a clock whose hands will span eons rather than minutes. Designed by the Long Now Foundation, it is eventually to serve as a publicly accessible timepiece that will inspire observers 'to conjure with notions of generations and millennia' (Long Now, 2021) – one of the foundation's members boldly states that, '[i]deally, it would do for thinking about time what the photographs of Earth from space have done for thinking about the environment' (Long Now, 2021). While the *Clock of the Long Now* in its proposed form does not yet exist, a prototype is currently on

display in London, prefiguring the respite from rapid consumerism and technological acceleration that the finished clock will purportedly offer. The project, first conceived in the 1980s, is now part of a wider cultural push toward practices that spark awareness of both the deep geological history of the earth and the need to preserve livable planetary conditions for many generations to come, essentially staging a plea for modes of thought that accommodate the long term.

While such interventions are usually made by environmental activists and scholars (Demos, 2020), the Long Now's founders notably include several Silicon Valley moguls, such as Stewart Brand and Kevin Kelly. These ideological roots betray a curious tension. How should we reconcile the clock's supposed deference to the sempiternal with the tech industry's focus on acceleration, instantaneity and planned obsolescence? Seen in this light, it is especially pressing that former Amazon CEO Jeff Bezos donated \$42 million to the project, and that a full-scale prototype will be constructed on his land in Texas. There is, after all, nothing long about the 'now' around which Amazon has built its empire, premised as it is on computationally optimized rates of productivity (Crawford, 2021: 85) and suites of services that offer consumers the luxury of one-click shopping, same-day delivery and seamless streaming. Amazon, in fact, is emblematic of the wider tech industry's tendency to 'burn through time' (Bowker, 2021: 128), exploiting and capitalizing on ever-shorter timespans. At the same time, Bezos's donation points to a notable trend within Silicon Valley to endorse ideas of *longtermism*, according to which the far future should figure more prominently in present moral considerations (MacAskill, 2023).

What are we to make of this uneasy co-existence of increasing speed and calls for contemplation, of a tech industry that relies on escalating temporalities while espousing the value of the long term? I suggest that, more than comprising a Janus-faced artifact – an incongruous emblem of an industry that accelerates rather than elongates the experience of time – the *Clock of the Long Now* and its internal discrepancies encapsulate two pertinent temporal conditions: first, that living in Anthropocene times paradoxically entails living in relation to two wildly divergent temporalities; and second, that the way the tech industry exploits these temporalities is not only deeply destructive but also legitimized through the type of longtermist rhetoric the clock exemplifies.

The first condition suggests that existence in the Anthropocene is defined by two seemingly incompatible temporalities – one too fast to fathom, the other too long to fully apprehend. Both of these temporalities have been the subject of recent scholarly debate. On the one hand, there is a rich strand of environmental theory (Bjornerud, 2018; Chakrabarty, 2021; Ialenti, 2020; Nail, 2021) that accentuates the need to think in *deep* geological timescales, both to better understand humanity's impact on the earth and its long past, and to envision futures beyond the short-term destructivity plaguing the planet. On the other hand, numerous media theorists (Bowker, 2021; Ernst, 2016; Hansen, 2015; Hayles, 2017) are grappling with the *microtemporal* quality of today's digital mediasphere, as human activity and agency are increasingly bound to technological processes that outpace human cognition. These two temporalities clearly impact lived experience, as today we inhabit a time of both climate catastrophes and algorithmic accelerations, of erased pasts and seamlessly mediated presents, of natural worlds lost and virtual realms created. However, despite their centrality to contemporary existence and scholarly debates, these temporalities are seldom thought together. The fact

that they nonetheless coalesce in the *Clock of the Long Now*, an ostensibly perpetual timepiece funded by an industry trafficking in ever shorter nows, not only raises the question of how exactly deep time and the technology sector's diminishing presents relate, but also of whether the clock's sweeping gesture of futural care is matched by the current operations of its benefactors. This latter question discloses the second dimension of the clock I want to highlight: the longtermist perspective it signifies glosses over, and even actively solidifies, the destructive way Silicon Valley currently links these temporalities.

The argument I develop in this paper is threefold. First, I assert that contemporary existence is regimented by two temporalities that cannot be perceived directly – deep time and microtime – and that this complicates familiar categorizations of temporal experience. Second, I demonstrate that deep time and microtime are technologically entangled in a way that materially and cognitively delimits the future; microtemporality is functionally premised on a destructive extraction of the deep time resources of the planet and is subsequently mobilized both to amplify and direct attention away from these underlying conditions. Third, I argue that Silicon Valley's funding of longtermist causes marks an attempt to control how deep time and microtime are culturally sensed and experienced, and that longtermism legitimizes the tech industry's current pernicious operations. Drawing these arguments together, I conclude that one of the core challenges of inhabiting the Anthropocene entails mitigating the harmful way in which Silicon Valley ontologically connects and culturally reframes deep time and microtime. In advancing this claim, this paper synthesizes and contributes to debates within cultural analysis, media studies and the environmental humanities to uncover cultural and material ties between the temporal logic of the Anthropocene and the temporalities that guide contemporary digital media.

## Shifting Temporal Experiences: Deep Time and Microtime

The German historian Reinhart Koselleck (2004) has famously theorized how, distinct from the natural flow of time, each period navigates and negotiates time in a historically specific manner. This involves not only the meanings attributed to history, but also the range of temporal experiences – as the cognitive calibration of past, present and future – that is culturally available. Historical times are never singular, nor are they the same for every individual, as they interweave heterogeneous scales, speeds and rhythms (Koselleck, 2004: 2). Koselleck (2004: 258) draws on the anthropological categories of experience and expectation to nonetheless tease out historical patterns, explaining how these categories 'simultaneously constitute history and its cognition [. . .] by demonstrating and producing the inner relation between past and future or yesterday, today, or tomorrow'. Each period yields its own historically determined spaces of experience and horizons of expectation, informing how past and future become embodied, lived and acted out. Accordingly, historical time and temporal experience (and the role of the present within them) change shape throughout history. Koselleck (2004: 3) identifies technology as one of the dominant factors to prompt temporal conversions, pointing to 'the technical-industrial transformation of a world that forces upon its inhabitant ever briefer intervals of time in which to gather new experiences and adapt to change induced at an

ever-increasing pace'. For Koselleck (2004: 274), temporal experience is thus bound to technological acceleration, and the more technology unsettles experiences in the present, the more hope and expectation are invested in the future as a time of progress.

However, today's technological mutations are throwing past, present and future (or the space of experience and horizon of expectation) into disarray in a fashion that diverges from Koselleck's interpretation of accelerated modern experience. For if, in Koselleck's theory, the issue is that a rift exists between the acceleration of technology and the socio-culturally available timeframes to experientially internalize these accelerations, a notable problem today is that technical-industrial transformations generate technologies that operate too fast to apprehend at all (even if they produce real, downstream effects). And while in Koselleck's (2004: 269) schema a restricted space of experience is likely to lead to a further investment in the future as a time of progress, the reality of anthropogenically caused climate change now destabilizes such futural faiths. Moreover, in addition to the imperceptible timeframes of contemporary digital technology, the Anthropocene forces on experience another timespan that is not directly perceptible – one measured in the inhuman scale of tectonic shifts and geological erosions. What, then, to make of contemporary temporal cognition, given that some of the most prevalent temporal forces of the day entirely transcend the space of experience?

The French historian François Hartog (2017, 2022) has extended Koselleck's project to render the contemporary experience of time intelligible, paying heed to the emergence of the Anthropocene as a concept that impacts temporal configurations. Like Koselleck, Hartog (2022: xviii) does not conceive of historical time as a fixed entity; time and our perception of it are, rather, products of cultural, technological and social processes. Hartog (2017) coins the term *regimes of historicity* to analyze how each society has its historically situated way of dealing with past, present and future, and how periods of temporal transition often result in cultural and epistemological crises. Much of Hartog's work is concerned with tracing how past temporalities of the West have culminated in what he sees as the contemporary epoch of presentism. Contributing to a wider body of research (Stiegler, 2018; Wajcman, 2015) that suggests temporal experience to be increasingly shaped by technological acceleration, Hartog (2017: xiv–xv) discerns a 'collective inability to shake off what is generally called "short-termism"', characterized by him as "'presentism": the sense that only the present exists, a present characterized at once by the tyranny of the instant and by the treadmill of an unending now'. Indeed, numerous converging cultural, technological and economic processes currently bolster an experience of time in which the present comes to dominate everything. Databases collapse one's sense of the past by subsuming a heterogeneity of historical remnants under the totalizing decree of the computational archive, economic developments progressively take shape according to the dictates of just-in-time delivery and digital technologies have molded an internalized craving for speed and immediacy – one only has to think of the visceral frustration that attends malfunctioning technology to see how embodied the demand for a seamlessly mediated present has become. For Hartog (2022: 195), these are all symptoms of an age enthralled by the now: 'Cycles of consumption have attenuated, everything is quickly obsolete, returns on investment happen overnight – the instant and the simultaneous are prized.' Clearly, this describes a different 'now'

than the one sought by the *Clock of the Long Now*, even though the Silicon Valley forces that make this timepiece tick equally animate the regime of presentism.

In recent years, however, presentism has come into crisis. For Hartog (2022), the emergence of the Anthropocene as a concept that produces new experiences of past, present and future is overriding familiar temporalizations. As the Anthropocene forces us to reckon with ourselves on geological timescales that miniaturize the scope of human history, the precarious transience of a diminished present finds itself engulfed in the immensity of the planet's past: 'Throughout its existence, presentism has seen time shrink continually to the point of near oblivion, and suddenly now it has to face a chronos time [. . .] that amounts to millions and billions of years' (Hartog, 2022: 209). Natural and geological history, long relegated to the peripheries of temporal perception, return with a vengeance, rising to curtail a present that was until recently considered all-encompassing. The idea of the Anthropocene thereby contests presentist experience. Yet, if digital humanities scholar Alan Liu (2018: 6) already worries about what is to become of the sense of human history in the digital era, when any fixed grasp on the past risks being dissolved 'in the thrill of the instant click', how to make sense of *deep* history? Liu's media archaeology stretches back to the earliest oral traditions, already straining our faculties of historical imagination, but this period still marks but a brief pulse within the play of geological eons. Nonetheless, as Harriet Johnson (2019: 60) claims, '[t]he Anthropocene challenges us to decipher a new universal history because we encounter a set of planetary forces and temporal scales that could not be a direct object of experience in our lives yet will be a determining factor for them'. Johnson (2019) and other theorists (Bjornerud, 2018: 14; Chakrabarty, 2021: 37; Ialenti, 2020: 2) argue that failing to think on these cosmic timescales will prevent us from assessing our impact as geological actors, as the extractions and pollutions that fuel contemporary modes of (presentist) existence directly uproot geophysical formations that condense billions of years. Following Danowski and Viveiros de Castro (2017: 9–12), the Anthropocene thus conjures a strange experience of deep pasts and unpredictable futures, shaped by the awareness that geological and environmental conditions that stretch back ages are, relatively speaking, coming undone in the blink of an eye.

Yet tying the deep geological past to the pace of blinking eyelids is still to frame things in the distinct register of human perception and therefore does not adequately grasp how presentism technologically takes shape today. More exactly, I suggest that the Anthropocenic realization of ourselves as geological agents is not the only temporal condition to throw presentism into crisis. There is another temporal condition that transforms contemporary temporal perception – one that is a logical consequence of presentism but at the same time yields implications no longer fully capturable by Hartog's concept. While presentism operates on a vision of the present as phenomenologically apprehensible by the human sensorium, today's mediasphere ordains a present steeped in the *microtemporal*, in which technological operations increasingly take place at such a speed that they remain closed off to human cognition. Hartog (2022: 212) does gesture at the exceedingly fast processing speeds that punctuate the present – he characterizes our time as one split between 'the Anthropocene and the age of the microprocessor' – but does not draw out the full ramifications of this situation, nor does he account for how these times are materially linked. As media theorist Hansen (2015: 37) contends, today's

world is one in which media ‘operate at microtemporal scales without any necessary – let alone any direct – connection to human sense perception and conscious awareness. [. . .] For the first time in history, media now typically affect the sensible confound independently of and prior to any delimited impact they [may] come to have on human cognitive and perceptual experience’. Humans have traditionally relied on technology to make the flow of time recordable and intelligible (Frabetti, 2015: 9–12; Stiegler, 2013), but technology now acts on the world to create temporal systems that are unavailable to human experience, even if they actively modulate human capacities for sensation and action. While technologies have always operated on a tension between the sensible and the insensible – electric currents and radio waves also thwart human perception, and the use of technology tends to be precisely that it compensates for qualities that humans lack – the unique feature of microtemporal systems is that they expand insensible layers of technicity, designed to address each other more than they address humans, that are progressively capable of autonomous activities *before* and *outside of* human agency. Algorithmic systems, AI models, environmental sensors and smart assistants are fabricated to operate faster than any human could, creating interoperative, communicative networks that only marginally involve human sense- and decision-making.

Increasingly, the microtemporal dimensions of digitality occupy a central role within media studies, and with good reason. As Geoffrey Bowker (2021: 137) explains, these dimensions comprise ‘a whole new ontological level which works at ever [smaller] time scales and yet which can have large-scale effects’. N. Katherine Hayles’ (2017) concept of cognitive assemblages and the possible risks she associates with such assemblages illustrate this. Hayles argues that we need a new model of cognition, as we have increasingly offloaded the work of selecting information and making decisions to digital systems. This means humans are now part of cognitive assemblages, in which information dynamically flows between human and non-human (technical) agents that interpret and act on that information (Hayles, 2017: 116). With this model, Hayles underlines the significance of microtemporality; expanding our understanding of cognition to include technological actors also discloses that autonomous, adaptive and interpretive capacities do not rest exclusively in the domain of biological organisms, and that certain realms of cognition may impact human existence while being irreducible to human experience. In part, Hayles (2017) offers an affirmative reading of such assemblages, as they allow us to augment our own cognitive capacities – she highlights (pp. 121–3), for instance, the ATSAC system in Los Angeles, which constitutes a complex, algorithmically-steered system that smoothens the flow of traffic.

Hayles, however, also identifies perils related to cognitive assemblages, most of which have to do with the temporal gap that exists between human and technological decision-makers within the system. As a poignant example, Hayles (2017: 142–77) points to the field of high-frequency trading (HFT) algorithms. As Beverungen and Lange (2018: 80) explain, these algorithms act on microtemporal timescales and thereby give rise to financial markets that are ‘only partly accessible to human consciousness’. Such algorithms certainly do not render humans obsolete, and Beverungen and Lange (2018: 82) describe particular ‘modes of awareness’ that traders develop to mitigate ‘the limited capacities of human consciousness’, but they do point to a proliferation of markets built around nonhuman accelerations that curtail the scope of human action. This, in

turn, opens up an already speculative economy to a host of unanticipated volatilities that may irrupt into reality to devastating effect (Hayles, 2017: 143). The prevalence of such microtemporal systems suggests that our planet, whose vast temporal scales the Anthropocene has brought into sharp relief, is simultaneously enveloped in a gossamer web of speed – a ‘planetary cognitive ecology’ (Hayles, 2017: 141) in which, for better and for worse, human perception and agency are entwined with technical layers of insensible velocity.

Returning to Hartog, one may wonder whether we are witness to a temporal crisis that shifts the constituents of presentism or even if we might be entering a new regime of historicity altogether. And returning to Koselleck, one may wonder whether, if we are to make sense of this new historical temporality, his schema should not be revised. For if, as Koselleck (2004: 258) suggests, experience and expectation generate ‘the inner relation between past and future or yesterday, today, or tomorrow’, it seems significant that our historical epoch is regimented by temporal processes that *cannot* be directly experienced nor fully anticipated. Today, the space of human experience comes charged with the awareness that past, present and future are delimited by imperceptible temporalities. Experience and expectation move to a cadence too swift to take stock of the tectonic but too plodding to keep pace with our machines. More exactly, this tentative new regime is determined by an impossibly long past that threatens the length of the future, and by a technical present that is increasingly incongruent with our own sensed now. This marks a stark divergence from previous regimes of historicity, which largely kept geology outside of their temporal purview and which were formed by technospheres not as explicitly designed to bypass human consciousness.

Of course, this is not to say that this new condition is homogeneous in its effects. Just as with presentism – where stark differences exist between those benefitting from acceleration and those tasked with sustaining the speed of others (Hartog, 2022: 208) – this new *micropresentism* exhibits unequal distributions of power. Likewise, the multifarious processes gathered under the name of the Anthropocene come with deeply uneven impact. In fact, the risk with a totalizing term like the Anthropocene is that it obscures how many human and other-than-human beings have been forcefully brought face to face with the reality of deep time upheaval long before the Anthropocene emerged as a category of thought (Demos, 2020: 9). Moreover, the term implies a break that, though certainly not clean, suggests a universal eschatology that glosses over the unequally lived realities produced by its effects (Haraway, 2016: 49). Acknowledging these risks, the next section will explore how deep time and microtime are united by more than their capacity to elude perception: they are ontologically connected in a way that deepens the extractivisms spread unevenly across the planet.

## Deep Time and Microtime: Extractivist Ties

The temporal situation described above in itself already poses a significant conundrum – how to simultaneously cognize the geological eons and algorithmic microseconds that regiment contemporary existence? An additional issue emerges, however, once one considers how these realms, divergent though they might seem, are ontologically connected insofar as one is materially dependent on (the exploitation of) the other.

Rather than conceiving of these temporalities as two separate forces, each thwarting time-consciousness from its own partitioned plane, we must view them as intimately linked and in constant interplay. More exactly, I argue that the tech industry currently binds microtime and deep time in a fashion that both materially and cognitively delimits the future.

Microtime, first of all, requires extensive material interventions to function, traversing ocean floors and mountain ranges. MacKenzie et al. (2012: 287), for instance, describe the threading of a fiber-optic cable between Chicago and New York that drills straight through the ancient Allegheny Mountains, all to achieve a reduced latency of 1.3 milliseconds in high-frequency trading. Likewise, consider the hyper-fast Google- and Meta-funded Apricot subsea cable system (12,000 kilometers in length) that links Singapore, Taiwan, Japan, Indonesia, Guam and the Philippines (Submarine Networks, 2021). The deep blue of the sea often appears marginal to our telluric concerns (Jue, 2020), so it is easy to forget that these cables uproot aquatic ecosystems and impact marine life to accelerate digital traffic (Starosielski, 2015). Equally inconspicuous are the data centers that buttress realms of microtemporality, still largely dependent on fossil fuels formed from the remains of ancient life (Devine, 2019: 147). Submarine cables and data centers here stand in for a larger fact about digital culture: technologies that appear frictionless, efficient and immaterial (often because of their insensible speed) frequently exact a heavy-but-obscured toll in terms of earthly resources (Kemper, 2022). The tendency for faster technologies to require more material, labor and energy is not magically annulled once technological temporalities drop below the threshold of human perception. On the contrary, the process of accelerating technologies beyond our purview is deeply extractive and materially mobilizes the deep geological history of the planet to impede the prospect of livable futures.

The clearest example of how microtemporal technologies, in exploiting the deep past, delimit the future is found in the mining of rare earth minerals, which, as environmental historian Iva Peša (2023: 125) argues, forms a foundational condition of the Anthropocene. Imperceptible and incogitable, these technologies devour lithium, lanthanum, copper, cobalt, neodymium, graphite and many other rare metals and minerals bestowed by the cosmic past. These resources, on whose magnetic and semiconducting qualities the digital economy hinges, have taken billions of years to form in the earth's crust (Pitron, 2020: 53–4). The technological developments that most dwarf human senses of speed are thus predicated on immeasurably long timeframes – the AI industry heavily depends on tantalum (Dauvergne, 2020: 93–5), quantum computers on gold and aluminum (de Leon et al., 2021) and 5G antennas on gallium and scandium (Pitron, 2023: 145). Here, microtemporality and deep time come face to face: the current geopolitical strife over the earth's mineral reserves is disproportionately driven by digital technologies and the microtemporal domains their growing computational capacities open up. Not only do these processes strip the past of its finite resources, but they are also defined by their massive material impact in the present, as the mining industry is one of the greatest drivers of environmental destruction, shaping a world awash with digital pollution (Crawford, 2021; Cubitt, 2017). Following ongoing processes of digitization and the new markets for speed that microtemporal technologies instantiate, these ecological demands will only increase in the coming years; as Pitron (2020: 159) explains, in the next

three decades alone, we are likely to extract more minerals from the earth than have been consumed in the entirety of human history. These minerals, in turn, often power machines that further impede planetary futures. For example, the use of AI models to intensify extractivism in mining (Brevini, 2022: 64–5) and the finance sector’s growing reliance on passive funds – algorithmically-driven funds that invest significantly more in fossil fuels than active funds do (Buller, 2022: 122–8) – both reveal how microtemporality is marshaled to actively negate sustainability goals. In a gesture that risks reproducing myths of digital immateriality, these material dimensions are notably lacking in a lot of the literature on microtemporality. Hayles and Hansen, for instance, pay little attention to the environmental impact of the technologies they describe, and philosopher Daniel Ross (2021: 198) builds his otherwise inspiring theory of sustainability on an untenable dichotomy between carbon technologies that pollute the biosphere and silicon technologies that pollute the mind.

The different instances I have described negate such accounts and reveal that micro-time materially constrains the future. As Parikka (2015: 113) – one of the few theorists to address both microtime and deep time – suggests, media are not simply vestiges of previous epochs but also artifacts that remain for the future; the matter and minerals of technology, as the ‘media technological equivalent of the half-life of nuclear material’, do not cleanly decompose, and even the most transient of connections can produce long-lasting effects. While this is true of many technologies – clearly, non-microtemporal technologies also rely on fossilized resources and generate waste that affects the future – the temporal situation I describe here is unique for its combination of the following three conditions. First, in the case of deep time and microtime, one imperceptible temporality is being used to create *another* imperceptible temporality. Second, the imperceptibility of microtime exacerbates the existing tendency to perceive the digital as immaterial and sustainable, even though microtemporality more extensively exploits the deep past and obstructs sustainable futures than many preceding technological temporalities do. Third, as the following paragraphs will explain, microtemporality currently fuels a consumption-oriented system that actively diminishes attention to and care for deep temporalities in the present. While it might seem to matter little from the perspective of cosmic time whether the earth’s resources feed into technologies that operate in microseconds, minutes or days, the salient point is that the current imbrication of deep time and microtime catalyzes processes that not only materially but also *cognitively* restrict the form of the future. This claim expands on recent suggestions (Marder, 2021: 2–5; Parikka, 2018: 178) that the Anthropocene is an environmental but also a perceptual condition, and that technology plays a role on both levels: not only are technologies materially invasive, but they also frame the concrete relations and modes of thought that precipitated but might equally moderate the extractivisms defacing the planet.

For what kind of technological world are countless minerals roused from their protracted slumber? Algorithms and AI-driven technologies progressively mediate cultural, social and economic processes. Rouvroy and Berns’s (2013) concept of ‘algorithmic governmentality’ and, more recently, Aradau and Blanke’s (2022) notion of ‘algorithmic reason’ explain how algorithmic, microtemporal systems today wield immense decision-making and decision-shaping power. For one, such power consists in generating forms of governance and regulation that transcend human control – one

can think, for example, of the HFT algorithms discussed previously and of predictive policing models that computationally intensify racial oppression (Sharma and Nijjar, 2023) – but the algorithms that users primarily encounter in quotidian technological practices are designed to modulate human drives and desires through the pre-emption and capture of attention (Hui, 2021; Seaver, 2018). Algorithmic media operate according to what Bucher (2020) terms a temporal *kairologic*, in which they attempt to keep users engaged by anticipating their desires and presenting them with the right piece of content at the right time. However, for this kairologic to take shape, microtemporal processes must constantly prefigure human activity, always arriving at the scene before the human sensorium does. These processes certainly do not operate entirely detached from human agency, but they do point to a temporal gap, earlier identified via Hayles, in which microtemporal technologies acquire disproportional agency for their tendency to pre-empt and circumvent human temporalities. This temporal gap becomes especially problematic if the microtemporalities that users encounter in their everyday engagement with technology are principally designed to amplify digital engagement and consumption. As the previous section specified, microtemporal technologies come with steep environmental demands and, if these microtemporal technologies are in turn devised to push a drive for *more* microtemporality, a recursive system of material extraction emerges.

The futural stakes of this temporal system can be further mapped through the work of Bernard Stiegler. Throughout his work, Stiegler remained consistently sensitive to the condition that, on the one hand, technologies must remain objects of care and attention if we want to understand and moderate their destructive capacities but, on the other hand, that such formations of care and attention are themselves *always mediated by technology*. As Stiegler contends (Stiegler, 2013: 4, emphasis original), technology is ‘at once what *enables* care to be taken and that of *which* care must be taken – in the sense that it is necessary to *pay attention*: [technology’s] power is *curative to the immeasurable extent* that it is also *destructive*’. This points to a contemporary problem: if we are to turn the ‘radical negativity’ (Stiegler, 2018: 36) of the Anthropocene into a more livable alternative, we first of all require care, as that human capacity not just to repair, maintain and mitigate but to think *carefully* about how technologies are to be designed and engaged. Digital technologies, however, are now largely built to pre-empt and modify the constraints of human care, reflection and attention. Indeed, Stiegler (2018: 44) frames this predicament as a *temporal* condition, gesturing at the ‘overtaking of the speed of nervous transmissions by the speed of fibre optics, which is also the overtaking of the speed of reason by an understanding that has become automatic’ (Stiegler, 2018: 44). For Stiegler (2018: 76), the history of computation consists in the rendering calculable and programmable of human cognition, and this has culminated in the rise of technical systems that operate at such speed and scale that the human brain is now pre-empted by the consumption-driven dictates of the market (Stiegler, 2018: 76).

While Stiegler does not sufficiently recognize that these same digital technologies also acutely expand the material pollutions of the Anthropocene (Kemper, 2022), he incisively exposes how our perception of and capacity to care for the world and its possible futures become increasingly tied up with the microtemporal domains of digital technology. As Stiegler describes, these operations predominantly take place

to ‘short-circuit’ (Stiegler, 2018: 37) desire by stimulating constant engagement and consumption – and, by implication, to divert attention from the designs of these technologies and, more generally, from the ‘long circuits’ (Stiegler, 2013: 41) of care that are needed to remain invested in the longterm idea of maintaining a habitable planet. By stimulating forms of desire that are premised on perpetual technological engagement and short-term consumption, the already materially wasteful realm of microtemporality thus also furnishes modes of cognition that further fuel the need for extractivism. In its currently dominant form, microtime thereby marks a continuation – and in many respects even an intensification – of the extractive model of capitalism that helped bring about the Anthropocene and that diminishes the prospect of a deep future.

The cognitive and material effects described here necessitate measures that meaningfully engage the codified temporalities of digital media in a number of ways. There is, for instance, an urgent need to explore how the attentional regimes composed through algorithmic governmentality can be loosened from the aims of control, consumption and digital expansion; how can we design networks that more actively involve human agency and decision-making? Likewise, when considering whether to outsource cultural practices to technological systems, evaluations should not solely involve direct social and cultural effects, but also environmental ramifications. However, given the temporal concerns of this paper, it is even more pressing to identify how Silicon Valley, while manufacturing exploitative temporalities, simultaneously funds a perspective on deep time that sanitizes and legitimizes these processes. Where the previous section stressed that deep time and microtime pose new challenges to temporal experience, the next section will suggest that Silicon Valley, in aligning itself with the temporal philosophy of *longtermism*, aims to mold this challenged temporal experience in a way that solidifies rather than thwarts its extractive operations.

## Silicon Valley’s Longtermist Wager

Silicon Valley has built an industry around accelerated timeframes but the *Clock of the Long Now* suggests it also attunes itself to the scope of deep time. In fact, the clock and its facilitating foundation form only one part of a wider constellation of Silicon Valley-backed projects, organizations and think-tanks that expressly underline the need to think in extended timeframes (Samuel, 2022) – see, for instance, the Future of Humanity Institute, Longview Philanthropy, the Forethought Foundation and the FTX Future Fund. Tech moguls like Elon Musk, Jeff Bezos, Peter Thiel and Sam Bankman-Fried have all invested significant portions of their capital in one or more of these deep future-oriented organizations. At face value, these investments might seem to spell a burgeoning sense of reluctance regarding Silicon Valley’s extractive business model and unsustainable binding of deep time and microtime. Such notions are, however, swiftly dispelled once one considers how these different institutions all converge around the idea of *longtermism*, which describes a philosophy that appeals to deep time to minimize rather than address the concerns charted here.

Indeed, longtermism can be glossed as Silicon Valley’s core temporal philosophy (Rubenstein, 2023: 159; Torres, 2024: 388), and the tech industry’s financial endorsement of this ideology betrays an active attempt to control how deep time and microtime

are made sense of. As I suggest in this concluding section, funding and promoting longtermism's invocation of cosmic timescales capacitates Silicon Valley to shape temporal consciousness to its benefit, where the unfathomable qualities of deep time become the legitimation for its current operations. This enables Silicon Valley to intensify its extractive microtemporal business model and to direct concern away from the destructive effects this model presently yields.

Longtermism essentially describes the (seemingly uncontroversial) idea 'that positively influencing the longterm future is a key moral priority of our time' (MacAskill, 2023: 4). Rooted in transhumanist philosopher Nick Bostrom's work on existential risk, and deeply tied to the movement of Effective Altruism, longtermism has recently been popularized through the work of Ord (2021) and MacAskill (2023) – Elon Musk, notably, described MacAskill's book as a 'close match for his own philosophy' (Torres, 2024: 388). Longtermism takes up the challenge of thinking with distant timescales and acknowledges the vulnerability of both humanity and the planet but draws different conclusions from this than the previously discussed environmental scholars do. While various interpretations of longtermism exist, it always advocates shifting moral concern to the far future, based on the reasoning that there can be inestimable numbers of people alive in the future, that the lives of these people have just as much moral worth as the lives of people living now, and that decisions we make today could deeply affect the existence of these future humans (Samuel, 2022). Hence, present moral evaluations should take the lives and wellbeing of these futural beings into account – contemporary activities should be steered by a drive to ensure an optimal existence for this virtual multitude, essentially establishing a relation of debt to the deep future (MacAskill, 2023: 7).

While some of this might seem morally compatible with addressing the issues the previous section described (after all, concerns about ecological destruction also involve the question of what we leave behind for the future), and while longtermism might appear like an antidote to the short-termist logic of presentism that Hartog describes, there are certain elements of its temporal scope that prove problematic. Torres (2024: 366), for example, has criticized longtermism for its utilitarian foundations: longtermism concretizes the ambiguous notion of 'positively influencing the longterm future' in terms of a maximization of value, however defined. For many longtermists, this logic of maximization entails that it is not sufficient to ensure a stable degree of wellbeing for a stable number of people; rather, the stock of future value should be expanded both qualitatively (for example through technologically enhancing cognitive capacities) and quantitatively (meaning that securing the proliferation of life in the future assumes moral primacy) (Torres, 2024: 370–71). This focus on expanding future value shifts moral concerns away from current injustices and to further technological development and the mitigation of existential risks, defined by Ord (2021: 37) as any 'risk that threatens the destruction of humanity's longterm potential'. Notably, issues like climate change and resource depletion are low on Ord's (2021: 110, 117) list of risks, as neither of these phenomena is likely to extinguish human existence entirely – Ord is much more worried about, for instance, the risk of runaway AI. For Ord (2021: 38, emphasis original), the prime moral purpose of our time should be to minimize such risks and to 'allow our descendants to *fulfil* our potential, realising one of the best possible futures open to us'. As Crary (2023: 50) has argued, this fixation on existential risks enables

longtermism to trivialize not only present inequalities but also their underlying conditions: longtermism aims to ‘safeguard humanity’s future in a manner that both diverts attention from current misery and leaves harmful socioeconomic structures critically unexamined’.

I want to expand on these critiques in relation to the temporalities of deep time and microtime: the longtermist appeal to far futures of infinite value enables the tech industry to mobilize deep time both to expand its microtemporal operations and to justify its destructive effects in the present. It is not hard to see what draws Silicon Valley to longtermism’s technologically tinged take on deep time, in which technological expansion magnetizes fantasies of far-futural salvation. As suggested, the effects of deep time and microtime challenge us to somehow make sense of these indiscernible temporalities, and by promoting longtermism Silicon Valley steers such sense-making practices in a particular direction. Rather than letting deep time and an attendant awareness of planetary finitude inspire moderation and humility, in longtermism deep time becomes the catalyst for expanding extractivism in time and space, even bestowing a cosmic grandeur on such operations. Because the deep future is a potential source of unfathomable value, considering that infinitely more people can be alive in the future than there are now (Torres, 2024: 386), any act that addresses present inequalities or stalls the requisite technological developments becomes an impediment to our moral obligation to realize this future. By extension, for longtermists the awareness of earthly boundaries legitimizes gazing toward the cosmos: both longtermists and Silicon Valley figureheads frame space travel as a moral necessity (Rubenstein, 2023: 159) – one may think here of Jeff Bezos’s admonition that existence on earth is doomed to be an existence of ‘stasis’ and ‘rationing’ (Rubenstein, 2023: 175). Longtermism, in sum, spins the emerging consciousness of deep time and planetary limits into a techno-optimist tale of continued technological development and cosmic colonization.

Longtermism thereby absolves Silicon Valley from attending to the material injustices it fuels in the present, but it also shapes temporal perception in a way that naturalizes technological expansion and the unquestioned extension of microtemporality. Because longtermism is functionally based on continual technological development – technological stagnation is one central threat to the future that MacAskill (2023: 143–63) identifies – it enables Silicon Valley to expand its extractive, microtemporal model without significantly altering its nature. MacAskill (2023: 95–7) proposes we live in a pivotal moment in time when the values we build into technologies now could shape the universe for millions of years, but the scenario that Silicon Valley is already significantly locking us into – a microtemporal future of endless digital extraction – does not figure into his reflections. Again, technological concerns pertain mostly to Artificial General Intelligence (MacAskill, 2023: 83–88) – notably, this is in large part because the microtemporal qualities of such a technology could accelerate processes beyond human control and understanding (Ord, 2021: 142–8) – but completely disregard the microtemporal system Silicon Valley is currently building, in which tying human desire to a materially ruinous cycle of digital engagement forms a prime source of value. In fact, given that longtermism is premised on the maximization of value without defining what value consists of, Silicon Valley’s exploitative business model is entirely compatible with its tenets, so long as it can continue indefinitely into the future.

Longtermism's vision of value-filled redemption imperiled by promethean threats discourages concern for how Silicon Valley and its technological branch of extractive capitalism presently undermine livable planetary futures. In this sense, I contend that the tech industry's bankrolling of longtermist causes reveals a fight over the very nature of temporal perception; it encourages a response to both the deep temporalities floodlighted by the Anthropocene and the microtemporality of contemporary media that leaves unthought how Silicon Valley's system of cognitive and material extractivisms degrades past, present and future.

While the slow swing of the *Clock of the Long Now's* pendulum might seem to emblemize care for the future, the clock is funded by an industry acting carelessly in the present. Philosopher Thomas Nail (2021: 274) suggests that '[t]he future is not beyond us, but immanent and within us. Therefore, caring for the future means caring for ourselves and all our relations now. Caring for the earth and the cosmos [. . .] is inextricable from the care of the future and the past.' With this claim in mind, Silicon Valley's longtermist rhetoric appears less like a sign of adequate care and more like a distraction from, or even vindication of, the technology sector's current failure to build toward a just future, owing to the unsustainable worldly relations it engenders. Silicon Valley is expanding an industry based on a destructive collusion of deep time and microtime, extracting the finite resources of the earth to diffuse a profitable domain of inhuman velocities. Longtermism is concurrently gaining traction as a moral theory, making it all the more urgent to expose how the technological culture that funds it tests the limits of the deep past and appropriates the prospect of a deep future to multiply materially and cognitively deteriorative temporalities. One of the core challenges of establishing a sustainable ethics for the Anthropocene is thus to uncover and confront the destructive technological forces that simultaneously exploit the material boundaries of the earth and the temporal experiences of its inhabitants.

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## References

- Aradau, Claudia and Blanke, Tobias (2022) *Algorithmic Reason: The New Government of Self and Others*. Oxford: Oxford University Press.
- Beverungen, Armin and Lange, Ann-Christina (2018) Cognition in high-frequency trading: The costs of consciousness and the limits of automation. *Theory, Culture & Society* 35(6): 75–95.
- Bjornerud, Marcia (2018) *Timefulness: How Thinking Like a Geologist Can Help Save the World*. Princeton: Princeton University Press.
- Bowker, Geoffrey (2021) Life at the Femtosecond. In: Volmar, Axel, and Stine, Kyle (eds) *Media Infrastructures and the Politics of Digital Time: Essays on Hardwired Temporalities*. Amsterdam: Amsterdam University Press, pp. 125–142.
- Brevini, Benedetta (2022) *Is AI Good for the Planet?* Cambridge: Polity Press.
- Bucher, Taina (2020) The right-time web: Theorizing the kairologic of algorithmic media. *New Media & Society* 22(9): 1699–1714.
- Buller, Adrienne (2022) *The Value of a Whale: On the Illusions of Green Capitalism*. Manchester: Manchester University Press.

- Chakrabarty, Dipesh (2021) *The Climate of History in a Planetary Age*. Chicago: University of Chicago Press.
- Crary, Alice (2023) The toxic ideology of longtermism. *Radical Philosophy* 214: 49–57.
- Crawford, Kate (2021) *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. New Haven: Yale University Press.
- Cubitt, Sean (2017) *Finite Media: Environmental Implications of Digital Technologies*. Durham: Duke University Press.
- Danowski, Déborah and Viveiros de Castro, Eduardo (2017) *The Ends of the World*. Cambridge: Polity Press.
- Dauvergne, Peter (2020) *AI in the Wild: Sustainability in the Age of Artificial Intelligence*. Cambridge, MA: MIT Press.
- de Leon, Nathalie P., Itoh, Kohei M., Kim, Dohun, et al. (2021) Materials challenges and opportunities for quantum computing hardware. *Science* 372: 1–19.
- Demos, T.J. (2020) *Beyond the World's End: Arts of Living at the Crossing*. Durham: Duke University Press.
- Devine, Kyle (2019) *Decomposed: The Political Ecology of Music*. Cambridge, MA: MIT Press.
- Ernst, Wolfgang (2016) *Chronopoetics: The Temporal Being and Operativity of Technological Media*. London: Rowman & Littlefield.
- Frabetti, Federica (2015) *Software Theory: A Cultural and Philosophical Study*. London: Rowman & Littlefield.
- Hansen, Mark B.N. (2015) *Feed-Forward: On the Future of Twenty-First-Century Media*. Chicago: University of Chicago Press.
- Haraway, Donna J. (2016) *Staying with the Trouble: Making Kin in the Chthulucene*. Durham: Duke University Press.
- Hartog, François (2017) *Regimes of Historicity: Presentism and Experiences of Time*. New York: Columbia University Press.
- Hartog, François (2022) *Chronos: The West Confronts Time*. New York: Columbia University Press.
- Hayles, N. Katherine (2017) *Unthought: The Power of the Cognitive Nonconscious*. Chicago: University of Chicago Press.
- Hui, Yuk (2021) Problems of temporality in the digital epoch. In: Volmar, Axel, and Stine, Kyle (eds) *Media Infrastructures and the Politics of Digital Time: Essays on Hardwired Temporalities*. Amsterdam: Amsterdam University Press, pp. 77–88.
- Ialenti, Vincent (2020) *Deep Time Reckoning: How Future Thinking Can Help Earth Now*. Cambridge, MA: MIT Press.
- Johnson, Harriet (2019) The Anthropocene as a negative universal history. *Adorno Studies* 3(1): 47–63.
- Jue, Melody (2020) *Wild Blue Media: Thinking Through Seawater*. Durham: Duke University Press.
- Kemper, Jakko (2022) The environment and frictionless technology: For a new conceptualization of the *Pharmakon* and the twenty-first-century user. *Media Theory* 6(2): 55–76.
- Koselleck, Reinhart (2004) *Futures Past: On the Semantics of Historical Time*. New York: Columbia University Press.
- Liu, Alan (2018) *Friending the Past: The Sense of History in the Digital Age*. Chicago: University of Chicago Press.
- Long Now (2021) The Clock of the Long Now. Available at: <https://longnow.org/clock/> (accessed 22 June 2023).
- MacAskill, William (2023) *What We Owe the Future*. London: Oneworld Publications.

- MacKenzie, Donald, Beunza, Daniel, Millo, Yuval, et al. (2012) Drilling through the Allegheny Mountains: Liquidity, materiality and high-frequency trading. *Journal of Cultural Economy* 5(3): 279–296.
- Marder, Michael (2021) *Dump Philosophy: A Phenomenology of Devastation*. London: Bloomsbury.
- Nail, Thomas (2021) *Theory of the Earth*. Stanford, CA: Stanford University Press.
- Ord, Toby (2021) *The Precipice: Existential Risk and the Future of Humanity*. London: Bloomsbury.
- Parikka, Jussi (2015) *A Geology of Media*. Minneapolis: University of Minnesota Press.
- Parikka, Jussi (2018) Deep times and media mines: A descent into ecological materiality of technology. In: Hörl, Erich, and Burton, James (eds) *General Ecology: The New Ecological Paradigm*. London: Bloomsbury, pp. 169–192.
- Peša, Iva (2023) Anthropocene narratives of living with extraction in Africa. *Radical History Review* 145: 125–138.
- Pitron, Guillaume (2020) *The Rare Metals War: The Dark Side of Clean Energy and Digital Technologies*. London: Scribe Publications.
- Pitron, Guillaume (2023) *The Dark Cloud: How the Digital World is Costing the Earth*. London: Scribe Publications.
- Ross, Daniel (2021) *Psychopolitical Anaphylaxis: Steps Towards a Metacosmics*. London: Open Humanities Press.
- Rouvroy, Antoinette and Berns, Thomas (2013) Algorithmic governmentality and prospects of emancipation. *Réseaux* 177(1): 163–196.
- Rubenstein, Mary-Jane (2023) *Astrotopia: The Dangerous Religion of the Corporate Space Race*. Chicago: University of Chicago Press.
- Samuel, Sigal (2022) Effective altruism's most controversial idea. *Vox*. Available at: <https://www.vox.com/future-perfect/23298870/effective-altruism-longtermism-will-macaskill-future> (accessed 6 January 2024).
- Seaver, Nick (2018) Captivating algorithms: Recommender systems as traps. *Journal of Material Culture* 24(4): 421–436.
- Sharma, Sanjay and Nijjar, Jasbinder S. (2023) Post-racial politics, pre-emption and insecurity. *European Journal of Cultural Studies*. Epub ahead of print 1 May 2023. DOI: 10.1177/13675494231168177
- Starosielski, Nicole (2015) *The Undersea Network*. Durham: Duke University Press.
- Stiegler, Bernard (2013) *What Makes Life Worth Living: On Pharmacology*. Cambridge: Polity Press.
- Stiegler, Bernard (2018) *The Neganthropocene*. London: Open Humanities Press.
- Submarine Networks (2021) Apricot. Available at: <https://www.submarinenetworks.com/en/systems/intra-asia/apricot> (accessed 22 June 2023).
- Torres, P. Émile (2024) *Human Extinction: A History of the Science and Ethics of Annihilation*. New York: Routledge.
- Wajcman, Judy (2015) *Pressed for Time: The Acceleration of Life in Digital Capitalism*. Chicago: University of Chicago Press.

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