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Afterword

Digital Anthropocene

Computing an Epoch in the Making

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While the Anthropocene proliferates as a figure and epoch for describing human impacts on earth systems, it has also recently been rejected as a distinct geological moment by the international Subcommission on Quaternary Stratigraphy (Witze 2024). If it had been accepted, the Anthropocene would have marked a new epoch delineating human-induced geological change. Crawford Lake in Ontario, Canada, was nominated as the location where the start of the Anthropocene was considered to be especially evident. The lake mud of this steep, deep and cold lake contains radioactive residues and particles such as plutonium that are considered indicative of human influence on earth systems, especially evident around 1952 (Anthropocene Working Group 2022). And yet, this epoch in the making has not displaced the Holocene, at least from the perspective of those administrators of geological timescales. Some committee members suggested that human influence on environments had been much more longstanding, dating at least to the beginning of the Industrial Age, or even earlier, to the inception of agriculture. Others argued that the changes have been more gradual than abrupt, which the 1952 date did not adequately reflect. The Anthropocene, it seems, is a lapsed age before it even began, despite the ongoing destruction of the planet.

A term that began to gather momentum in 2000 (Prillaman 2022), the Anthropocene has since generated reams of research, writing, creative practice, and political activism across multiple fields to address and respond to the irrevocable changes that human activity, from carbon emissions to pollution and biodiversity collapse, is wreaking on the planet. If not yet recognized as an epoch, then the Anthropocene is still a critical juncture and reckoning with the extreme and extensive influence of human disturbances to the Earth's geology and ecosystems. What multiple Anthropocene researchers and practitioners have established is that

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there is a need to re-evaluate environmental relationships and inhabitations. Part of this project also involves rethinking the terms of the Anthropocene: who counts as the “human” in this epoch, and which impacts are most significant, linked as they are to raced and classed subjects and diverse environmental inhabitations (Yusoff 2018; Gabrys 2022).

At the same that the Anthropocene epoch remains in limbo, numerous other -cenes are proliferating, from the Capitalocene to the Plantationocene, the Plasticocene, the Militaryocene, and many more (e.g., Davis et al. 2019; Haraway 2015; Lorimer 2017). Declaring the present moment, its recent histories, and perilous futures as a distinct age has become a linguistic sport. What are the attractors and advantages of epoch-making and epoch-thinking? The epoch as a container or mobilizer of events could help to make sense of moments of considerable upheaval and change. It allows for adjacent comparisons, examination of temporal causality, or a broader analysis of events across social, political, ecological, and economic forces. While an epoch captures an extended slice of deep time, it could also miss the goings-on of day-to-day life. Absent are the variations in seasons, the range of environmental actors and influences, and the significant moments of environmental upheaval that could only be a flicker in extended and sedimented timespans. In this sense, the epoch could enable a joining together but potentially restrict from view a finer-grain understanding of changing environmental conditions.

This “Digital Anthropocene” collection published in *NatureCulture* gives us another perspective on the Anthropocene, specifically as it intersects with digital technology. Originally sparked through a two-session panel at the 4S/EASST conference on science and technology studies in 2020, this examination of the interwoven dimensions of planetary change and digital technology opens up for consideration the ways that changing environments and computational infrastructures are co-constituted. This collection demonstrates that these co-emergent infrastructures have shared and varying colonial histories and contemporary social-political imbrications that influence how Earth systems are understood, related to, and addressed. The fusing of the digital and the Anthropocene further brings to light distinct technoscientific conditions of planetary overload that digital technologies would at once seemingly manage and yet exacerbate.

This collective reflection on the Digital Anthropocene signals toward wider and transdisciplinary fields of research and practice at the intersection of digital technology and environmental concerns. Editors of this collection have previously composed a syllabus of Digital Anthropocene-related texts, which documents a field in the making (Douglas-Jones et

al. 2020). While less epochal in its focus, the intersection and co-constitution of digital technology and environments has also been the focus of my work for more than several decades now, what I describe in *Program Earth* as the “becoming environmental of computation” (Gabrys 2016). I have examined the environmental fallout from proliferating digital technologies in the form of electronic waste (Gabrys 2011), as well as the monitoring and managing of environments with sensor technologies, whether by citizens or scientists, and the wider digitalization and “smartification” of environments (Gabrys 2016; 2022). In this earlier and ongoing work, I have examined the materiality of seemingly immaterial digital devices by considering how they fossilize into a “natural history of electronics” (Gabrys 2011). This specific *Digital Rubbish* work focuses on how digital technologies remake environments and bodies since the pollution that occurs throughout the making and breaking of electronics leads to significant environmental justice concerns. Digital technologies, in other words, can perpetuate and amplify inequalities, extractivism, and environmental pollution at the same time that they monitor and mitigate these problems.

Resonating with and extending these research foci, the articles in this collection bring fresh insights in relation to the Digital Anthropocene topic and framing through their engagement with topics ranging from remote sensing to climate governance, environmental data justice, and speculative design. Each contribution in this special issue highlights how deeply the Anthropocene is intertwined with colonial histories and technological infrastructures. These conditions are not merely background information but are integral to understanding how contemporary digital technologies influence and change environmental and societal interactions. The articles collectively demonstrate how colonial infrastructures, steeped in technological inequality and injustice, also present opportunities for reimagining politics through digital mediations. This “double vision,” as the editors note in reference to Haraway, challenges us to consider how these legacies both constrain and enable new forms of political and social engagement.

The articles in this collection especially draw attention to the operations, objects, actors and techniques of the Digital Anthropocene. Digital modalities give rise to different practices and engagements with environments, where ways of computing can generate contingent configurations. The operations that the *Digital Anthropocene* sets in motion can be, on the one hand, practices for addressing planetary problems. On the other hand, they can also signal the limits of these practices, as they generate distinct social-political worlds. Sensing and seeing are examples of how observation can generate distinct Anthropocenic engagements. Saadia

Mirza's article, "Sensing in and Beyond the Digital Anthropocene," shows how remote sensing technology is a crucial tool for documenting landscapes in the Anthropocene. By engaging with satellites, drones, and other sensing technologies, researchers like Mirza have developed distinct ways to visualize and interpret landscapes altered by conflict and environmental degradation. Remote sensing uncovers the scars left by human activities while revealing markers of environments in distress. Mirza's work exemplifies how digital cartography and modeling enable us to see beyond surface patterns. For instance, landscapes in conflict zones, such as Afghanistan, are depicted not just as barren or war-torn but as complex terrains where historical and cultural narratives intersect with environmental changes.

These images can challenge traditional historical, colonial and militaristic interpretations of landscapes, thereby offering speculative and counter-narratives that reconsider commonplace understanding of these regions. Here, Mirza proposes to enrich remote sensing through a practice of ethnographic sensitivity. This approach examines the cultural and historical contexts behind the data, providing a deeper understanding of how environmental and societal changes impact communities. Mirza's work highlights the importance of this perspective, showing how remotely sensed data can intersect with potentially less overt dimensions of cultural erosion and community displacement. Understanding these contexts and conflicts is crucial in the Anthropocene, where human impacts have become so extensive. Ethnographic sensitivity helps to contextualize digital data, making it clear that behind every image of a devastated landscape is a story of human suffering and adaptation. The Digital Anthropocene materializes not just through physical damage but also through the cultural and historical consequences of environmental change.

The Digital Anthropocene further materializes in this collection through the distinct research objects it enacts and mobilizes to manage and mitigate planetary distress. Different delineations of climate, data, temperature, resources, sensors, pollution, and more create distinct understandings and approaches to climate change. Sarah Vaughn's article, "The Limits to Computational Growth: Digital Databases and Climate Change in the Caribbean," analyzes the growing use of databases to address climate change. Focusing on the Caribbean Community Center for Climate Change (5C), Vaughn develops the concept of "limit-politics" to frame the struggle of overcoming colonial legacies and technological dependencies. The 5C's digital tools, such as the Caribbean Climate Online Risk and Adaptation Tool, highlight the potential and limitations of climate governance, where more data can generate more dependency on digital infrastructures from distant power centers. While initially promising,

these tools face significant challenges as climate impacts intensify. As an increasingly central tool for documenting, forecasting, and responding to climate change, these databases demonstrate the complex colonial, material, economic, and social-political forces that converge in situated conditions of monitoring and governance (cf. Douglas-Jones et al. 2021; Knox 2020).

As this collection demonstrates, the actors of the Digital Anthropocene can unsettle the usual operations and objects of identifying and acting on climate change. A climate database takes shape along with entrenched dynamics of coloniality, power, and resources. However, the Caribbean-based scientists who mobilize this technology and infrastructure develop other practices for working around the data demands and expectations for climate governance. In a related register, in “Repairing the Anthropocene: Toward Civic Validity for Environmental Data Justice,” Lourdes Vera examines how community-based monitoring can remake engagements with air pollution. Focusing on the fracking landscapes of Texas, Vera develops the concept of “civic validity” to propose ways to integrate community data into scientific practices. Communities engaged with environmental sensors and data collection tools are fighting to hold polluters to account through expanded and alternative data practices. This civic engagement mobilizes toward greater environmental justice as residents work to document and communicate environmental harms and their effects, thereby realizing a form of “civic validity.” This approach represents a grassroots effort to mobilize and articulate civic potential in the face of environmental destruction. In the Anthropocene, where traditional regulatory frameworks have often failed, civic engagement offers a way to address environmental injustices and advocate for change. These investigations are especially crucial when the Digital Anthropocene can be more or less mobilizing for different civic actors, when often the scale and scope of climate change are designated as a realm of expert management and control (cf. Dalsgaard et al. 2021; Gabrys 2022).

The techniques of the Digital Anthropocene are another central area of inquiry in this collection. If Vera focuses on collaboration across communities, expertise, and methods to address increasingly polluted environments, then other articles in the collection mobilize, propose, and investigate remote sensing, ethnography, and speculative design as a way to transform the contours of the Digital Anthropocene. Exploring exactly this more experimental register, James Maguire, Cyrus Clarke, and Monika Seyfried consider the trajectories of speculative design as it navigates the Digital Anthropocene in their text, “Biotechnology and the Climate Emergency: Speculating with Grow Your Own Cloud.” Maguire et al. analyze how digital data could be stored in the DNA of plants, creating organic data storage devices

that could potentially sequester carbon while remaking computational clouds. This speculative encounter represents an attempt to reconcile technology with nature, in an alternative vision of the Digital Anthropocene that they refer to as a “pre-figurative politics.” Gardens storing data in DNA is a vision that reworks usual narratives of environmental destruction. At the same time, future-oriented innovations can forestall and postpone the immediate actions that are needed to prevent ongoing environmental damage, something these authors caution can be a hazard of speculative design imaginaries (cf. Yusoff and Gabrys 2011). These techniques variously show how different and pluralistic epistemic approaches to the Digital Anthropocene are necessary, that digital devices and infrastructures are always carriers of and conduits for complex power struggles, and that commensurability across experiences and contributions to the Digital Anthropocene are not typically possible. This further raises the question of what practices need to be invented to work within—and beyond—the Digital Anthropocene, including which different forms of community, connection or conversation need to be instigated.

These Digital Anthropocene investigations underscore the importance of diverse perspectives and approaches in sensing, mapping, managing, and intervening within environmental conditions. Remote sensing technologies provide a detailed view of the physical and political landscape, revealing the impacts of human actions on the environment while highlighting the cultural and historical dimensions of ecological degradation. Climate governance systems offer different strategies for addressing climate change when engaged from within the residues of colonial infrastructures. Civic engagement empowers communities to act against environmental harm, thereby transforming governance practices. Speculative design can spark inventive transformations of material and environmental infrastructures and practices. These cases reveal moments of possibility as well as struggle, where different epistemological and ontological encounters with the Digital Anthropocene can differently sense, map, manage, and intervene within environmental conditions. The modes of engagement that are co-constituted with Anthropocenic conditions, in a sort of “rubber boots” immersive methodology (Andersen et al. 2023), are key to developing and advancing careful and sustained research into imperiled conditions.

Altogether, this collection invites readers to encounter the Anthropocene through its digital imbroglios and correspondences. If the geological timeline has not yet been officially updated since its last point of rupture nearly 12,000 years ago, then this may yet be an opportunity to continue experimenting with the terms and terminologies that spark generative

encounters with planetary distress and upheaval, while considering the colonial histories and inequalities that have contributed to current environmental issues. The research presented in this issue demonstrates that the Anthropocene is already computational, even if this epoch has not settled into a defined form. From the contaminated sediments of Crawford Lake to the remote sensing images of Afghanistan, the databases of Caribbean climate governance, the civic monitoring of Texas fracking pollution, and the speculative gardens of DNA storage, there are many more figures and sites of environmental disturbance and remaking that draw attention to the challenges of current and sedimented environmental inhabitations. The question these works pose is how it could be possible to foster more equitable and informed approaches to environmental and technological governance that are able to grapple with an unpredictable planet.

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