

# Environmental Geography and the Inheritance of Western Technoscience

## Introduction: Inheriting Western Technoscience

Environmental geography's tensions with Western technoscience are baked into the discipline. In the decades since its rather short-lived 'quantitative revolution,' dismantling the primacy of the Western technoscientific episteme and its division of nature and society has become a core feature of the field. Many geographers have come to understand Western technoscience as "a practice that assumes mastery over Nature, reproduces the doctrine of discovery, revels in exploration and appropriation of Indigenous Land, and is invested in rigorous self-portraiture in which valid scientific knowledge is created only by proper European subjects" (Liboiron 2021, 20). But while critiques of technoscience have only gained traction in the past half century, geography has maintained connections to wider, global change—and avoided a return to regionalism—by relying on knowledge created in more positivistic disciplines elsewhere (as well as the physical geography branch of our own). But, environmental geography frequently engages in only selective critique of technoscience. After all, scientific knowledge is often the basis of environmental justice claims in environmental scholarship as well as the legal system. And, wider environmental geography often makes assertions about environmental presents and futures on the basis of scientific calculations such as climate modelling, expectations of sea level rise, rates of species extinction, and the chemistry and the toxicity of pesticides.

What this calls attention to is not the hypocrisy of environmental geographers but the ways that we are both irrevocably and often productively entangled with the sciences. In this brief essay, we call for a more coherent critical approach to Western technoscience in environmental geography: one that is transparent about and responsible for its undeniable entanglements as our inheritance. While our focus here is on the legacy of Western technoscience, we also acknowledge the tenaciousness of other forms of analysis that do not always centre Western scientific understanding, especially various Indigenous knowledge systems (e.g. Schneider forthcoming; Bawaka Country, et al. 2018; Whyte 2017). The existence and persistence of these often violently minoritised ways of knowing are further reason for academics working within dominant geographic disciplinary frameworks to grapple with the inheritances of Western technoscience, rather than simply accepting them on one hand, or attempting to discard them by appropriating indigenous knowledge systems on the other.

To think of Western technoscience as an inheritance is to conceive of it as neither exclusively a gift or a burden but rather as a legacy that conditions the possibilities of environmental geography in a non-deterministic way. It requires recognising not only Western technoscience's legacy of imperialism, militarism, and capitalism, but also that its ontological and epistemological claims condition the very identification of environmental problems and their solutions. As Isabelle Stengers (2018) reminds us, we inherit a particular way of posing problems. We don't just see, therefore, the ruination of Western technoscience all around us; we are beholden to it for the very ways *that we see*. The inheritance of Western technoscience is not something in the past, but rather shapes what we can see, the questions we ask, how we ask them in the present, and how we plan for livable futures.

These tensions have been nowhere more present than in the Anthropocene discourse. Even as environmental geographers analyse and intervene in the debate about the era's start date and nomenclature, there is frequently a deference to the authority of the geology, not to mention a

celebratory embrace of geology's seeming affirmation of human geography concepts (e.g. the inseparability of nature and culture). Especially in the early days of Anthropocene discourse while human and environmental geographers engaged anew with the *content* of geological knowledge, and even debates within the field, there was little effort to analyse the conditions of production of this knowledge, as well as its imperial legacies (an issue that Kathryn Yusoff's work has worked to remedy [Yusoff 2018]). Related engagements with the interdisciplinary fields of new materialism and the environmental humanities have similarly relied on scientific claims about the demise of global environmental conditions. Consider, for example, the widespread acceptance of the measures that make up Steffan's "Great Acceleration" narrative and related measures (Dalby 2013), measures of microplastic contamination and macro-waste that buttress arguments for "the Plasticene" (Davis 2022), claims about past anthropogenic uses of fire (Clark 2010), the science of ocean acidification (Alaimo 2016; Buck 2020), or general discussions of the consequences of climate change (Parenti 2012). In each of these articulations of the Anthropocene, some deference to science is suggested, if not demonstrated outright. But, to loosely paraphrase Derrida (2012), the inheritance of Western technoscience presents environmental geographers with a "double injunction": to both recognise our inheritances and to transform them.

We approach this problematic as two self-identified environmental geographers from similar human geography, environmental humanities, and science and technology studies (STS) backgrounds. In addition, we are writing as white Anglo academics who both call two seats of empire home; our orientation to Western technoscience and our suggestions of what should be done with it would likely be different if we were writing from a different perspective in relation to it. We also recognise that a wide range of approaches that fall under the heading of environmental geography - including political ecology and critical physical geography - have developed cogent critiques of Western technoscience in different ways. Here, we do not intend to elevate any subfield or critical engagement over any other. And, rather than policy or other applied dimensions of environmental geography, we address primarily the conceptualisation of and related empirical engagement with contested natures. Similarly, we begin from the recognition that Western technoscience is not one thing; our arguments here are therefore necessarily simplified. Rather than attempt to review environmental geography much less Western technoscience in all its complexity, we put forward some general propositions that follow the work of STS scholars and others. Along the way, we call up some relevant examples from across environmental geography as well as interdisciplinary work that has been frequently referenced in the field (while we acknowledge there are many others). Finally, rather than taking a novel approach to the inheritance of science, our aim in this short piece is to draw on a long legacy of theoretical work that has contributed to a critical vocabulary and approach to Western technoscience. Building primarily on the work of Donna Haraway, Sylvia Wynter, and their interlocutors, we offer a series of provocations in the form of four principles for environmental geography's engagements with technoscience.

Over thirty years ago Donna Haraway developed language for considering the inheritance of Western technoscience in "A Cyborg Manifesto" (1990). The cyborg itself, a "condensed image of both imagination and material reality" (Haraway 1990, 150), remains paradigmatic of a non-innocent engagement with the ills of its inheritance, in this case as the product of a militaristic and colonial legacy. For Haraway, the present and future of the cyborg is not pre-determined by its roots. Indeed, its origins are neither singular nor deterministic, but both partial and plural. Haraway's text invites readers to inhabit this subjectivity, to recognize themselves neither as innocent victims nor necessarily violent perpetrators of contemporary

global conditions. Rather, a cyborg subjectivity builds from a world recognized as already a wreckage. Committed to “partiality, irony, intimacy, and perversity”, the cyborg is unfaithful to what it inherits (1990, 150-1).

The partiality of Haraway’s cyborg is, of course, rooted in her own geographic positionality in the affluent West. From the perspective of anti-colonial thought and the spatial and racial history of the Caribbean, Sylvia Wynter has similarly written of human subjectivities that are both conditioned by and exceed the narratives of Enlightenment science. Wynter’s stories and essays highlight the active interplay of matter and story-telling. As she writes, humans are a “storytelling species” as well as biological entities; like Haraway’s cyborg, Wynter’s human is both partial and plural. But if Haraway’s goal as a cyborg is to be unfaithful to her origins as a biologist and progeny of US Imperialism, Wynter crafts a subjective position that is ever more faithful to the uprooted, enslaved, and colonized histories that make up the Caribbean. She does not aim to betray or ironically uptake her ancestry, but to embrace what she often refers to as a “demonic” perspective born of the “ex-slave archipelago” (McKittrick 2015, 2). Writing in conversation with Wynter as well as other anti-colonial and black studies scholars like Hortense Spillers, Katherine McKittrick suggests that a liberatory inquiry must start with just such a “disobedient relationality that always questions, and thus is not beholden to, normative academic logics” (45). Such an inquiry, for McKittrick, requires methods that move across disciplines and toward what Édouard Glissant referred to as “an unknown that does not terrify” (ibid.).

While these defiant subjectivities may appear to be in tension, we find both essential in considering how to approach Western technoscience today. In what follows, we read Haraway, Wynter, and their interlocutors together to develop a series of principles that underlie some of the most instructive work in the field of STS and related disciplines. Haraway has been widely engaged in environmental geography for her work on multispecies encounter, environmental ethics/politics (including recent debate on some problematic tendencies of her later work [see, for example, Lewis 2017]), feminist theory, and technology. However, her orientations toward and commentaries on scientific knowledge have garnered perhaps less recent attention. Likewise, Wynter and McKittrick’s work are increasingly taken up in feminist, anticolonial, and Black geographies, but have as yet been less influential in environmental geography. Together we emphasise how their perspectives on scientific inheritances and defiant subjectivities might contribute to more reflexive engagements with environmental sciences across environmental geographies. Our aim is to advance an explicit conversation on what it means to be unfaithful heirs of Western technoscience, and to bring this discussion to the new journal *Progress in Environmental Geography* from its inception.

***Principle 1: Environmental geography is non-optionally entangled with Western technoscience***

Asked of her attention to cybernetics, Haraway says,

This is about those objects that we non-optionally are. [...] This is not some kind of blissed-out technobunny joy in information. It is a statement that we had better get it – this is a worlding operation. Never the only worlding operation going on, but one that we had better inhabit as more than a victim. We had better get it that domination is not the only thing going on here. We had better get it that this is a zone where we had better be the movers and the shakers, or we will be just victims (Gane 2006, 139).

Here we can read Haraway's assertion that engagement with technoscience is not something we can dip in and out of, opt for or turn against; it fundamentally shapes us, though not without room for manoeuvre.

In considering entanglement with Western technoscience, and its ways of thinking and doing, environmental geographers might question what we mean, and could mean, by science. The notion of technoscience already has a sort of worldliness to it. The term indicates the co-evolution of science and technology. Such a co-evolution defies distinctions between what is "found" and what is "made" as well as that between theoretical and applied science. Accordingly, technoscience is a term that describes environmental conditions. By 'Western' technoscience, we mean not just a praxis of science that became hegemonic through the colonial encounter to the exclusion (or, in cases, violent inclusion) of other ways of knowing, but also the violent forms of dispossession and racial knowledge structures through which contemporary humanness and human-as-knower emerged (McKittrick 2015; Weheliye 2014; Mitman 2010).

Thus although it is true, then, that Western technoscience has no 'innocent' inheritance, we might also find useful the distinction that Leslie Green (drawing on Enrique Dussel) makes between science, "investigative scholarship for which any claim is open to question and reasonable answer" and scientism, "an unreasonable faith in the claim that science is neutral and independent" (2020, 38). Western technoscience inevitably includes elements of both science (as defined by Green) as well as scientism. Concepts of science can be further multiplied by highlighting what McKittrick and Mignolo term Wynter's *scientia*, which itself draws on Aimé Césaire's science of word. *Scientia* sets aside a biocentric notion of the human and emphasizes the simultaneous co-emergence of cultural and biological understandings of ourselves and the world (McKittrick 2015).

While environmental geographers might find it more or less easy to disavow scientism and affirm science and/or *scientia* (or at least some varieties thereof), we suggest that more attention ought to be paid to how different modes or orientations underpin the empirical objects and ontologies with which environmental geographers engage. While we might wish to work with them differently, both science and scientism are present in the inheritance of Western technoscience for environmental geographers. Moreover, environmental geographers might be well positioned to unpick the relationships between science and scientism, which entails an analysis of power, materiality, and the cultural politics of knowledge production. We might also turn toward Wynter's *scientia* as a form of interdisciplinary collaboration which could transform the inheritance of Western technoscience

In geography, we see Louise Amoore (2020) work with these challenges as she asks not simply what the politics of algorithms are but how algorithms have shaped what is considered political. McKittrick's analysis of algorithmic surveillance in Chicago schools similarly highlights how algorithms are productive of racialised political realities. As she writes, algorithms are "future-making mathematic equations" (McKittrick 2021, 116); they carry into those futures the racist and racialised histories that feed into them. In the case of Chicago school surveillance, the dehumanisation of black children, "is a variable in the problem-solving equation before the question is asked" (111).

Closer perhaps to the disciplinary home of environmental geography, Mansfield and Guthman (2015) have explored the ways in which epigenetics has been shaping and reshaping notions of normality and abnormality. And interdisciplinary environmental studies scholar, Max Liboiron (2021), shows how dominant scientific framings of pollution both depend upon and reinforce colonial epistemologies of land as resource. Environmental geographers can build on this work to consider not simply the governance, practices, and materialities of technoscience (e.g. Nost and Goldstein 2021) but also how technoscience shapes the questions we ask.

***Principle 2: Western technoscience, and environmental geography, are world-making endeavors***

Worlding, or world-making, is a key concept shared among Haraway and Wynter's work. Haraway, explicates how worlds emerge at multi-scaled intersections of matter, lives, words, economic and political structures, and speculative imaginaries. In conversation with Stengers, Haraway refers to this as a "cat's cradle" of knotted worldings (Haraway 1994). Worlds emerge where things, desires, and knowledge producing practices take hold or knot together in a place, sector, or community. One way to apply this to our integration of environmental geography and STS is to note that it is not just representations of the world that are created by Western technoscientific activities but worlds themselves, which extend into and beyond these representations. We do not just inherit Western technoscience as a set of practices or ontologies, but we also inherit the material worlds made through its activities. In geography, for example, Kasia Paprocki (2022) writes of climate change "not only as a set of discourses about the future but also a set of material relations that anticipate that future" (102487).

For Wynter, the conjuncture of biological and narrative forces, or what she refers to as "bios-mythos", is the foundation of worlds (McKittrick 2015, 25). Like Haraway, Wynter's "worlds" are plural. But more than a plurality, they constitute a terrain of struggle. Wynter's central problematic is, at least in part, the bifurcation of worlds created by colonialism. Through the colonial project, the Middle Passage, and the technological capacities that enabled both, the Western system of modernity, its universalist vision of "proper" human life, and practices that would establish a "freedom" from the constraints of the natural world (through a narrative of "mastery") emerged. But this world, and the colonialist norms of being human that it birthed, also negated itself in the bodies and lives of those enslaved by it. As Wynter writes:

It was to be in the holds of the slave ships among the chained-to-the-walls-cum-chained-to-each-other Negro/Negra as commercial cargo, thereby, out of their collective experience of being cast as the total negation of human freedom, as well as, indeed, of being another genus to being human in the West's now monohumanist, secularizing terms, that the dialectical *terrain of struggle would begin to increasingly emerge. This terrain of struggle—and the holds of the slave ship as origin—identifies...a historico-mutational reconception of...who we are as humans* (McKittrick and Wynter 2015, 62, emphasis in the original).

Understanding the worlds that are worlded by Western technoscience—and productive of struggle—also means grappling with the paradoxical nature of entities that do not precede technoscientific knowledge creation but that nonetheless assert their own materiality. Environmental geographers are practiced in this tradition, from early work on "poststructural political ecology" (Escobar 1996) to foundational scholarship by Bruce Braun who states that

“approaches to nature’s social construction which stress the so-called ‘implosion’ of the epistemological and the ontological are not, as some have charged, idealisms which collapse the material into the discursive, but rather point to the simple fact that this implosion is achieved continuously in the mundane practices of daily life, whether by scientists, state officials or workers” (2000, 14).

Environmental geographers inevitably study phenomena worlded by Western technoscience, but we might do so more explicitly, with attention to the political economies, material impacts, terrains of struggle, and unequal opportunities and burdens of science, and not just its ontological effects - though these are important too. Studying science in this way is not simply a matter of engaging with the biographies of famous men; it is also attending to the labour of the many unnamed and unremembered who have toiled in the name of science (e.g. Oreskes 2000). Moreover, while much of this work so far has been in the mode of a ‘history of the present,’ we suggest that environmental geographers might also work in a mode that is anticipatory and explicitly political, whilst also concrete. What worlds do we want to see worlded in the 21st century and what role does technoscience play?

### ***Principle 3: Environmental geography - sympoetic or autopoetic?***

If the goal of environmental geography is not only to analyse existing conditions, but also to rearrange them, to bring new ways of knowing and new worlds into being, what are the mechanisms that would inhibit or precipitate such a rearrangement?

Wynter and Haraway both adopt metaphors from biology to explore the possibilities of emergence and change. Wynter borrows from Chilean scientist and philosopher Humberto Maturana’s writings on *autopoiesis* to argue that epistemology functions as a self-organising system “enacted *outside* of our conscious awareness” (McKittrick 2015, 28, emphasis in the original). The narrative systems that make up our ways of knowing appear, for Wynter, as laws: they produce knowledge systems that seem intractable and ontological rather than products of narrative creation. For her, the continual erasure of narrative is central to colonial and capitalist world making. That erasure itself is the result of a storytelling endeavor which denies culture, politics, and contestation. Such stories of erasure subordinate us to inherited epistemic systems that masquerade as unquestionable reality. And, as Wynter writes, it is “imperative that these laws...be no longer allowed to function *outside our conscious awareness*” (McKittrick 2015, 28).

Wynter glimpses the enactment of another set of epistemic conditions—and other worlds altogether—in the oppositional anti-colonial and social uprisings that would recognise humans as what she calls hybrid-biological and narrative-beings. Only through such a recognition could we begin to override the preconditions of social relations. In geography, we can see an emergent dialogue between work that seeks to identify and critique ontological narratives and their impacts, and scholarship that seeks other ways of narrating and enacting being (e.g. Gay-Antaki 2020; O’Lear 2016; Paprocki 2022). Paprocki’s work (2022), for example, clearly demonstrates how scientific discourses of “viability” in coastal Bangladesh are not only co-produced by political economies, but also shape the “politics of possibility for lives and livelihoods in the region” (8). Those same discourses further foreclose local alternatives for adapting to climate change. As an alternative, Paprocki suggests an approach to scientific research that is self-reflexive of its epistemic commitments, interdisciplinary in approach, and capable of prioritizing the perspectives of local communities.

Rather than autopoiesis, Haraway turns to the concept of sympoesis to make a similar set of arguments about the need to exit assumed epistemes. Against the notion that any entity is self-made *or capable of self-invention*, Haraway encourages an expansion of relations, connections, and ways of being. Of course, by now relationality is deeply embedded in the intellectual projects of much environmental geographic scholarship, but we suggest extending these orientations toward the discipline itself. How and with whom we create the discipline matters - we can't disavow the inheritance of Western technoscience but we can carefully consider the relationships between it and other disciplinary entanglements (see also Liboiron 2021). This would mean that progress in environmental geography is not something we can engineer from the inside, but must develop in relation to our cognate disciplines - from the Earth sciences to the environmental humanities. Interdisciplinarity is the starting point, not the goal, but this is an interdisciplinarity that is itself non-innocent and laden with power relations. It is also an interdisciplinarity that can be recognised as inherently creative of narrative epistemic frames, following the work of Wynter and McKittrick.

Haraway's sympoesis "marks both a descriptor of the entanglements that underpin life— and not necessarily to the advantage of human survival— and offers a model for new forms of multispecies kinship that will be necessary amid an increasingly precarious existence" (Schuller 2018, 57). Yet, as Hamilton (2019) points out, while Haraway has much to say about sympoetic multispecies kinship and the worlds it could engender, she is less instructive on the concrete steps it would take to create those worlds. This, we think, is an area where environmental geographers might productively intervene. Through careful empirical engagement, environmental geographers can develop grounded theories of change which both recognise and transform ontological and material inheritances.

We see evidence of this craft in the work of Max Liboiron (2021) who works within the life-worlds of "dominant science" to transform them through anticolonial engagements forged in concrete relations of responsibility. Historian of science, Michelle Murphy (2017), similarly engages closely with chemical entanglements to imagine different worlding possibilities attuned to past harms and future potentials.

With sympoesis and autopoiesis, we might see that while inheritance is about obduracy it is also about transformation; as Rosalyn Diprose writes of inheritance: "we cannot simply accept it and reproduce it unchanged; in enacting it, in responding, we have chosen to keep it alive" (2006, 437). By recognising our entanglements with Western technoscience, we might be able to transform them, becoming active participants in questions about what constitutes 'good' science in an age of environmental crisis, and the relationships between science, politics, and activism.

***Principle 4: The inheritance of Western technoscience is at the heart of environmental geography's response-abilities***

Haraway defines her concept of 'response-ability' quite simply (perhaps deceptively so) as the ability to respond; and this, ultimately, is central to what she cultivates across her writings. But there are implications: "decisions must take place somehow in the presence of those who will bear their consequences" (Haraway 2018, 61).

For Haraway, responsibility for the worldings that entangle markets, humans, nonhumans, and scientific practices "requires the cultivation of viral response-abilities, carrying meanings and materials across kinds in order to infect processes and practices that might yet ignite

epidemics of multispecies recuperation and maybe even flourishing on terra in ordinary times and places” (2012, 311). If environmental geographers seek to produce scholarship that is responsible to the various crises in which we find ourselves, then perhaps we might continue to unpick how response-ability is configured and reconfigured across disciplines as well as between species and kinds.

While Wynter does not write on responsibility directly, her approach to defiance and intervention provides important guidance here as well. As noted, Wynter writes from the perspective of the Black Caribbean, where a history of brutality is both inherited and exceeded to produce “new modes of being human” (Walcott 2015, 191). Writing on her work, Rinaldo Walcott argues that the Caribbean is a place where what is inherited is neither “dissolved or resolved” but rather become sites “of the making and remaking of the human category as one of possibility—and thus a vernacular cosmopolitanism forged in an unknown creolization...one that does not get out of the mess of Enlightenment modernity by sidestepping its inventions, but rather by grappling with them” (Walcott 2015, 198). This is a human that, as Katherine McKittrick argues, is—or has the capacity to become—“a manifestation of new ways of living with each other that emerges from an interspecies-interecological schema” (McKittrick 2021, 42). To craft such a schema requires simultaneously taking responsibility for grappling with inheritances and inaugurating futures. We might also take inspiration here from geographic work that understands and defines Anthropocene ethics through concrete engagements at sites of injustice, rather than through abstract principles or totalising discourses (Schmidt in press). Here, relations of obligation and responsibility rise to the fore; as Elizabeth Povinelli (2011: 9) writes, “the potential futures to any actual world do not emerge willy-nilly. Debt/credit relations tie up and encumber the future with present obligations, and these obligations are literally carved into landscapes and subjects.”

Here we might begin to understand the limitations of our inheritances - and how we can engender different inheritances for our disciplinary descendants. As Haraway writes, “holding the unasked-for pattern in one’s hands” is central to response-ability (2018: 61).

## **Conclusion**

The inheritance of Western technoscience is a central feature of environmental geography, both its grounds and its problem. Of course, the very notion of ‘progress’ in the field (and indeed ‘the field’ itself) is laden with colonial histories, as the editors of this journal themselves acknowledge. For us, the concept of inheritance, thought with Haraway and Wynter, provides a way of foregrounding the centrality of Western technoscience without a sense of inevitability or blind acceptance. Instead, we find different modes of engagement with this inheritance: first of all, recognition, but also confrontation and transformation. If ‘progress’ is to be made in environmental geography, it is through these forms of non-innocent engagement with the legacies of technoscience in and beyond the discipline. Haraway’s metaphor of ‘string figures’ is instructive here - that we must ‘hold the forms’ of inherited structures, but always in a process of transformation, collectively, and temporarily. We take final inspiration from Haraway’s words on the openness of this inheritance. “My intention is that readers will pick up the patterns, remember what others have learned how to do, invent promising knots, and suggest other figures that will make us swerve from the established disorder of finished, deadly worlds” (Haraway 1994, 66). May environmental geography (continue to) invent more promising knots and “demonic” figures that make us swerve.



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