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ARTICLE

Becoming a Wild Researcher Through Goethean Science, Indigenous Philosophy and Creative Response

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Abstract

Framed by biological and environmental education, this paper addresses eight questions posed in *Wild Pedagogies: Touchstones for Re-Negotiating Education and the Environment in the Anthropocene.* These questions ponder more-than-human methodologies, positionality of the natural world, embedded anthropocentricism and research implications for the natural world. Wild pedagogues aim to reclaim and reimagine an educational system toward intentional praxis less reliant on quantifiable learning outcomes, with a move toward active, "self-willed pedagogy" with an agential nature as co-teacher. This bold enterprise challenges dominant Western-colonial paradigms rooted in power and control over nature and learners. My responses explore Tim Ingold's notion of a "modest, humble, and attentive" science, ecocentric place-based research, questions dissection and animal experimentation, and offers Goethean science and Indigenous philosophy as alternatives to rational-reductionist Newtonian science. Lab-based science is contrasted with natural history, and creative, contemplative practice are suggested as tools of the wild researcher. How can we transform science education through the lenses of deep ecology and philosophical posthumanism? This paper contributes to the ongoing dialogue of ecological and environmental education during the Anthropocene, especially in regard to the life sciences and the often-unquestioned use of nonhuman animals in science teaching and research.

Keywords: Animal experimentation; Indigenous science; Robin Wall Kimmerer; science education; Tim Ingold; Wild Pedagogies

Introduction to Wild Pedagogies

Near the end of the book, *Wild Pedagogies*, Sean Blenkinsop poses eight questions in relation to nature as co-teacher, nature as co-researcher, and just representation of the natural world. These questions ponder more-than-human methodologies, community-based research methods, positionality of the natural world, embedded anthropocentricism and research implications for the natural world. Wild Pedagogies is a project and concept that explores multiple theories and practices used in teaching that, although often framed through ecological and environmental education, are likely relevant across the curriculum. Wild pedagogues aim to reclaim and reimagine (Jickling, Blenkinsop, Morse & Jensen, 2018) an educational system toward intentional praxis less reliant on quantifiable learning outcomes, with a move toward active, "self-willed pedagogy" (p. 161) with an agential nature as co-teacher. This bold enterprise is "a challenge to dominant cultural ideas about control — of each other, of nature, of education, and of learning" (p. 161).

With the *Wild Pedagogies* book in hand, I travelled to Norway in 2019 for the Walking Colloquium. I read and felt the resonance of the eight closing questions. I was nearing the end of twenty years of university biology instruction, and reflected that questions such as these were never considered. Posing them may have exposed oneself to ridicule. My interdisciplinary background meant I often questioned regular practices such as dissection and animal experimentation. I made it clear that I would not cause harm or death to any animal, common job requirements in biology departments. In 2025, I was invited to co-teach Indigenous Perspectives in Biology (INDG/BIOL 1492), which marks a dramatic shift in how a biology course is taught. This course, like these eight questions, prioritises respect and reverence in biology.

This reflective and conceptual paper aims to challenge the dominant culture in regard to biological pedagogy and scholarship. I consider lab-based science that is ecocentric, which requires a reassessment of current animal dissection and experimentation practices. How can we transform science education through the lenses of deep ecology and philosophical posthumanism? How might Goethean science complement Newtonian science? What does it mean to be a wild researcher? The importance of place-based education and Indigenous perspectives are examined, particularly in relation to teaching and research in the life sciences. All of these considerations are threaded through with Wild Pedagogies' "relevance of learning *with* rather than *about* the natural world" (p. 164). By answering the eight questions put forth in the *Wild Pedagogies* book, I hope to contribute to the ongoing dialogue of ecological and environmental education during the Anthropocene, especially in regard to the often-unquestioned use of animals in life science teaching and research.

Eight questions on being a wild researcher

1. How does the natural world ask and answer its own questions? What are its accepted methodologies?

The idea of the natural world asking questions and giving answers suggests anthropomorphism. The question above is an effort to disentangle conventional research practices and "to push against troublesome cultural norms, become activists, build rich communities, and engage with the natural world in different ways" (Crex Crex Collective, 2018a, p. 127). Does a corpse plant that blooms once every seven years ask when it is time to flower? Does the grizzly bear ask the winter frost when to hibernate? Does the river ask how long it must flow to reach the ocean? Perhaps such more-than-human customs do not require questions, but are so intimately familiar, more deeply ingrained than DNA, that the answers are provided without question. These answers are carried in the pheromones of *Amorphophallus titanum*, the reflections of nascent ice, and the salmon depositing her eggs in gravel beds. Do humans, and their presumptive free will, possess similar instinctual responses? If so, our walls, screens, and sheltered lives serve to cloud such instincts.

No organism can survive in isolation. Think of Douglas-fir, roots entangled in mycorrhizal soil, tended by the voracious earthworm, which feeds the robin, whose nest rests in Douglas-fir. While the top-down, reductionist approach of experimental biology offers much toward medical research and discerning life's building blocks, the natural world is principled on much larger webs of relationships. The mechanistic and atomistic approach of Newtonian science deconstructs and deanimates. Thomas Berry (1999) puts it this way: "The world of mechanism has alienated us from the wild beauty of the world about us" (p. 54). The Renaissance man Johann Wolfgang von Goethe offers an alternative relational approach. Goethean science, being reciprocal, creative, utterly interrelated, and eliminating the subject-object orientation, fully embraces ecological thinking, and thus bears some kinship with the transdisciplinary methodologies of the natural world. The modern Newtonian scientist aims for mathematical objectivity, laboratory experimentation, and pushes bias aside. The Goethean scientist explores bias as part of the

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approach, employs fine-tuned sensory engagement and imagination, and a deep attunement with the subject under reciprocal study (Landman-Reiner, 2020).

During the question period after his "The Sustainability of Everything" presentation, Tim Ingold (2019) declared that we need to "ground our science in poetry." As both a scientist who writes poetry, and a poet who teaches science with poetry, this statement intrigued my tendency toward interdisciplinarity. But what, exactly, did he mean? Does grounding science in poetry refer to Earth-centreing our science? Literally, grounding, as in fully inhabiting the land? Perhaps Ingold meant something akin to Carl Leggo's (2005) statement of "living poetically" (p. 178), to be still, to love, and feel the presence of the world through a visceral connection mediated by the senses.

Poetry offers something evocative, sensorial, relational, and often provokes mystery and wonder. Poetic inquiry, a research methodology rooted in autoethnography and creative and diverse expression, can help decolonise practice (Cooms & Saunders, 2023) and can deepen connection to place and complement science education (Beavington, 2024) by bridging the arts and the sciences. Today, specialisation and compartmentalised knowledge has endangered polymaths such as Margaret Cavendish, Alexander von Humboldt and Goethe, at a time when art-science-philosophy transdisciplinarity is especially needed to address wicket problems such as the climate crisis and global inequities.

The scientific method, applied in the natural sciences, by its own impartial mandate does not engage in a reciprocal relationship with the object of study. In order to study life, to limit variables, bias, and incorporate controls, you must constrain and de-humanise (or de-animize) the specimen of interest. The social sciences have methodologies, such as multi-species ethnography (Rose, 2017), that provide agency to other-than-humans; biology does not. 100 million rats and mice are used annually in medical experiments in the United States alone (Kopnina, 2017). The lab rat may not be killed (although very often they are), but it will be isolated so extensively from its natural environment that essentially the rat no longer possesses an animate life beyond its instrumental value. To train in biology — the study of life — you learn to kill what you love.

This is why I refused to do dissections, both as a post-secondary student and as a lab instructor. Conservationist and professor Aldo Leopold (2013) lamented the fact that by the mid-1900s biology students were no longer learning on and about the land, but were instead "taught to carve cats" (p. 414), and how "the living animal is virtually omitted from the present system of zoological education" (p. 413). Cultivation of moral responsibility for the land has slowly been dismissed, while the wonder for animals that brought many biology students to this study is chiselled away by the scalpel.

Ingold (2019) claims not to be anti-science, although he certainly expresses reservations toward the current scientific enterprise being "bamboozled by numbers" and "must shed its totalitarian impulses and recognize that its peculiar way of knowing is neither sovereign nor absolute" (2024, p. 12). From an anthropologist's perspective, he is clearly frustrated with current scientific practice, and, given the chance, I suspect he would argue for a closer marriage of philosophy and the natural sciences.

Biologists claim that the use of nonhuman (their term) animals is absolutely essential to increase our understanding of the human animal, especially in regard to medical breakthroughs. E.g., we can and do reduce human suffering considerably by experimenting on nonhumans. Yet I can't help but see parallels with the climate crisis. We exploit and abuse the planet extensively for human benefit, and increasingly recognise the cost of this enterprise. For environmentalists and eco-philosophers, it is becoming more and more difficult to justify harming what is *not* human for the strict benefit of what *is* human. Classical libertarianism and traditional western thought affirm human exceptionalism, where humans, as the most important beings on the planet, can utilise and exploit the other-than-human world as fits their perceived needs. In similar fashion, the life sciences and industrial-capitalist enterprises pave over (sometimes literally) other-than-human

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considerations as a matter of course. Moral extensionism (Singer, 1975) and deep ecology (Naess, 2008) broaden the moral umbrella, granting rights and values beyond human life.

An ecocentric methodology, where the mutual flourishing off all beings is recognised, would cause less harm to other-than-humans, yet also require humans to take and use less. Indigenous scholar and botanist Robin Wall Kimmerer (2013a) points to this paradox: our "need to resolve the inescapable tension between honoring life around us and taking it in order to live is part of being human" (p. 177). A carnivore must kill to live, yet top-down predators can support biodiversity through trophic cascades that prevent the overaccumulation of certain species, such as sea stars preying on mussels.

Ingold spoke to needing a science that is "modest, humble and attentive." The word 'modest' suggests that the scientific view of the world is only one method of procuring useful, impartial knowledge that can be integrated with other ways of knowing that might include reciprocity, empathy and relationality, as do many Indigenous cultures, leading us toward a moral pluralism. Leanne Betasamosake Simpson's Land as Pedagogy, when we learn "both *from* the land and *with* the land" (p. 150) where "the land must once again *become* the pedagogy" (p. 160), holds resonance here and with three of Wild Pedagogies' touchstones: Nature as Co-Teacher, Locating the Wild, and Time and Patience.

Next we have 'humble,' being the diametric opposite of arrogant, suggesting the idea that science sees itself — along with humans — at the top of the academic heap. In his paper, "Designing Environments for Life," Ingold (2013) speaks of scientific knowledge and inhabitant knowledge, which "occupy two poles in a hierarchy of power" (p. 236) with the former clearly at the top, and a unilateral top-down flow. This hierarchy places scientific knowledge above land-based or Indigenous wisdom, and such laddering can lead to condescension, discrimination, or — far worse — cultural genocide. The word humble actually has origins in the Latin word *humus*, meaning earth. It seems Ingold is asking science to be grounded with and of the earth.

Goethean science, which involves prolonged looking and deep empathy, is an alternative to reductionist-mechanistic Newtonian science. Certainly modern science often involves a type of prolonged looking, as some studies take decades to complete. Yet Goethe points to a reciprocal relationship with the subject of study, whereby the observer (i.e., scientist) also learns from the subject through creative response and philosophical engagement (Beavington & Bai, 2018). There is an opportunity here for other-than-human players to be given agency, to become co-researchers, with understandings and points of view that differ from that of humans. Simpson (2017) articulates the importance of "intimate relationships of reciprocity, humility, honesty, and respect with all elements of creation, including plants and animals" (p. 150), which requires humble attention.

This brings us to Ingold's final and third word, 'attentive.' We can be attentive by considering the impacts of our actions, through metacognition, mindfulness practice, and a fierce sense of wonder. Such attentiveness speaks to shifting from "a world that can be occupied, but not inhabited" (Ingold, 2013, p. 242) toward seeing the world as "a conversation of life itself" (Ingold, 2018, p. 158). Natural science takes place in this world, and therefore should reconsider a return to its foundational focus: the humus from whence we all arrived.

2. How do/did/might I engage with other-than-humans and represent them in my/our work?

In July 2016, I partook in a sacred mountain journey among the Cascade Mountains. Facilitated by PeerSpirit Wilderness Quests, this intentional journey involved several days of human connection and preparation — through discussions, writings, and reflections — and then venturing to a multi-day solo spot. The other-than-humans were my neighbours, my confidants, my annoyances, my mentors. These encounters deepened my understanding of place-based, holistic learning where the natural world is a co-learner. Later, I connected this to the wild pedagogies' "premise that an important part of education can include intentional activities that provide a fertile field for personal and purposeful experience without controlling the environment and its actors, the learners, or the outcomes" (Jickling et al., 2018, p. 161).

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I learned, slowly, sometimes stubbornly, to listen to the burrs that stuck to my prayer flags (and held them in place), the patience of ponderosa, the dandelion seeds lifting my awe into the sky. They are represented through my eyes, yet with an understanding that, although I cannot comprehend their *umwelt* (coined by Jakob Von Uexküll, meaning unique sensory world of an organism) fully, I still endeavour to *see* them fully with my mind and with my heart.

In life science education, there are two forms of engagement with other-than-humans: field- and lab-based. Field-based studies in the Romantic era, inspired by natural philosophy, included observations, drawings, and specimen collection. Modern field biology, with its shift toward quantitative research, includes (though is certainly not limited to) population estimation, ice core analysis, ecosystem mapping, and invasive species management.

Laboratory biology is frequently microscopic or molecular in focus: gene mapping, chromatography, cell culture. Of course, the *original* source of this research stems from the natural world, such as DNA samples, animals for dissection, and fetal bovine serum. Laboratory settings are controlled, hold sensitive equipment, and can mitigate confounding variables.

This environment frequently reduces the subject of study to an object and its individual building blocks, and then attempts to understand how they fit together in the larger whole. As developmental biologist Scott Gilbert puts it, "once gene theory took over, it became a biology of things" (as cited in Cepelewicz, 2020, A verb not a noun section, para. 7). The laboratory setting is built to examine nouns: objects, things, items of interest whose ethical consideration is often signed away on a perfunctory form. Yet Gilbert also acknowledged a shift, in that "Twenty-first-century biology is a biology of processes" (ibid). This new approach, however, remains typically Western: a theoretical foundation for biology that starts "by formalizing the concept of the individual according to a set of principles and measurements" (Cepelewicz, 2020, para. 10). The emphasis is clear: the individual, and the quantifiable.

In terms of other-than-human representation, numbers and statistics based on empirical and evidence-based research, of obvious import for objective scientific study, are nevertheless reductive and atomistic, offering a less authentic truth to other-than-human identities. Pickering and Kara (2017) argue that the inordinate focus on details (where natural sciences excel) can limit ethical engagement, since "traditional methods of presentation may sacrifice some scope for engagement and accessibility in return for greater detail and depth" (p. 299). The choice "between 'literal' (empirical, evidence-based) and 'real' (authentic, experiential) truths" (p. 299) has led some researchers to creative representations, such as poetry. They further contend the importance of situational ethical decisions, where ethical engagement occurs throughout the research relationship, "rather than long after extractive encounters" (p. 299).

In engaging and representing other-than-humans, creative responses can avoid portrayals limited to static figures and tables. As Ingold (2024) puts it, "The goals of today's science, more than ever before, are of modelling, prediction and control. It has consequently fallen largely to art to take on the mantle of radical ecological awareness that science has cast aside" (p. 12). Interdisciplinary studies that integrate the natural/quantitative and social/qualitative sciences (sometimes referred to as the "hard" and "soft" sciences, with the latter often less dehumanising), might better acknowledge other-than-human preferences and viewpoints. As Kimmerer (2016) reflects, "The data may change our minds, but we need poetry to change our hearts" (p. 48).

Natural history is perceived today often with a derogatory mindset of not being "real science," which has led to "the rise of the modern sciences [where] we began to think of the universe as a collection of objects rather than as a communion of subjects" (Berry, 1999, p. 16). GIS has replaced sketches, and ANOVA has supplanted direct experience. If we crunch the numbers long enough, we will get to the truth.

Apart from ecology, my university experience emphasised lab-based science. I recall pithed turtles placed before us in dissection trays, their hearts still beating while their brains were presumably dead. As a scientist-in-training, I needed to turn off my sentiment, and focus on the electrocardiograph readout of a heart that would run its end by the end of the lab period. To get

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through this lab — scientifically and emotionally — I needed to see the turtle as an object. To more fully represent other-than-humans in our work, there is a need for a multivocal plurality and a reflexive "ethics of engagement" (Pickering & Kara, 2017), which place-based learning and creative expression afford.

Whether it's vivisection, cell culture, or developmental biology (grow chicks and kill them at various early life stages to see how they *would* have developed, had we not killed them) modern biology has firmly shifted its focus from the holistic natural world to molecular, genetic, and laboratory-based study. Thomas Berry (1999) states it bluntly: "As now functioning, the university prepares students for their role in extending human dominion over the natural world, not for intimate presence to the natural world" (p. 73). To embrace an Indigenous ecology, Nlaka'pamux scholar Grenz (2024) articulates that "a life of reciprocity" (p. 174) where we "reimagine a connection to the land" (p. 178) requires us to consider the affordances and needs of each outdoor learning site. The place must be given agency and be part of the conversation and become a daily educational practice.

3. Where is the natural world positioned in my research? To what and whose end?

The natural world can be a bedrock for scholarship. Only through direct experience in outdoor environments, such as river walking Elgin Creek during a salmon spawn or hiking to melting glaciers in Norway, did much of my philosophy develop and crystallize. Goethean prolonged looking and deep empathy have the potential to clarify language use and cultivate shifts in perceptual frameworks. Where I once saw the sea urchin as an organism for scientific study, I now have a wider-eyed view of the world (much like the urchin's radial perception) that considers the mutual flourishing of all that surrounds me.

At this juncture, a few words on 'experience' and its being "grounded in Euro-North American epistemologies" (Fox, 2008, p. 39) bear importance. In the Western notion of experiential education, experience centres on a linear, individualistic conception. In response, this demands a reflexive approach, examining the Eurocentric "privileged subjective experience" (p. 44) and how it can neglect the cultural, social and political environs in which they are embedded. As Fox elucidates, we should "nourish a practice that is attentive to and accountable for power relationships" (p. 52), and part of this includes dismantling the human/animal/plant/land hierarchy and reforming it into an ecology of intimacy (more on this in my response to question 6).

Much of my research begins with place. Of particular concern is cultural appropriation and honouring the traditional lands where lived experienced might occur. In this regard, learning the historical, geographical, ecological and ancestral histories are necessary to avoid reductionist perceptions. These sites serve as research locations, a habitat to dwell with other-than-humans, untangle a thread or two in interdependent ecosystems, and embody our own relationships with the natural world. In this way, nature has the potential to become a co-teacher and even co-researcher.

For nature to be a co-researcher, where the voices of the land are recognised as agential, valid, and vital, we must "consider research subjects more as partners not objects and hence, come to practice, present, and understand research differently" (Crex Crex Collective, 2018a, p. 127). Other-than-human co-authors, such as the bonobo apes that provided input on their welfare in captive environments (Savage-Rumbaugh et al., 2007) offer one example. (I will note that APA style requires me to omit the names of the bonobos from the in-text citation, so I present them here: Kanzi, Panbanisha, and Nyota.) Similarly, research can explore nature as a co-researcher where other-than-human voices are heard and considered, yet also stretches beyond primates — or even domain Eukarya — to include natural ecosystems and wilder places.

My scholarship promotes a philosophical shift toward an environmental ethic for educators and scientists. Through intentional outdoor experiences that integrate science, art and philosophy, the objective is contemplative practice that results in a deeper sense of time, creativity, and ecology. I strive toward authentic listening to the more-than-human, ending animal cruelty in

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scientific labs (hundreds of millions of vertebrates are 'used' in experiments annually), and rekindling a sense of the sacred. This must begin with the land, inspired by ideas such as Leanne Simpson's 'land as pedagogy' and Jennifer Grenz' 'medicine wheel for the planet'.

As a third-generation European-colonial-settler, I acknowledge that part of my research goals' are to garner grants, publish articles, and be afforded new hiring opportunities. I try to balance these more self-centred motives with a contemplative approach that is mindful of my impact on other-than-humans and humans alike.

4. Have I tried to represent my findings in a way that does justice to the contributions of others?

Scientific studies in biology journals rarely acknowledge research specimens beyond Latin name, sex, and number. Sometimes how they were acquired is mentioned (to help with repeatability), but rarely is there an explanation of how they were "disposed" of afterward. I have never read about gifts or gratitudes for the animals or plants used, at least in scientific journals. Contrast this with Kimmerer's (2013a) note that "In some Native languages, the term for plants translates to 'those who take care of us'" (p. 229).

In my pedagogical research, I can honour the teachings afforded to me by the meanders of wild rivers, the spring fiddleheads, and the "epistemic mess" (Lehrer, 2010) that are clouds. When we represent our findings, we can attempt to do so in a manner that both honours the inspiration and recognises that we cannot give a full voice to any person, animal, plant or other entity — we can offer only glimpses into their universe, and trust that our portrayals and interpretations are reasonably authentic. I am certain there are times I have failed in this regard. I try to be transparent in this uncertainty. As for biology, we need to take another cue from Kimmerer (2013b): "science abandons humility, when it dismisses what it cannot comprehend, when it replaces respect, responsibility and wonder, with arrogance and hubris, then like overgrown bean vines, its very productivity endangers life rather than sustains it" (p. 66). Let us start by expressing gratitude and honouring those we use or kill in order to learn more, so we can be transparent in this paradox. Let us end by embracing alternatives to animal experimentation.

5. In what ways did I enter and engage with research locations? Might there be room in community-based research methods to include more-than-human communities as full members?

Whether for a walking colloquium, teaching a field school, or a personal contemplative sojourn, my place-based research is largely serendipitous. This certainly diverts from the scientific method, specifically as taught in first-year biology, and the proposal of a specific hypothesis to test experimentally. Of course, hard-nosed lab-based scientists might say my research isn't really research (since it's not quantitative). They might say these research sites — forest, river, mountain — aren't really research sites, because I could have done this research anywhere (since the human brain is the only real researcher, and so it doesn't matter where the human brain is located). They will say that 'business as usual' needs to continue, if we are to cure cancer (requiring animal experimentation) and mitigate the climate crisis. Ironically, this same line of thought is what has exacerbated the climate emergency. It is our disregard for the other-than-human world that is drastically affecting the climate, habitats, pollution and biodiversity. In fact, climate scientists take ice core samples, store them in freezer farms, and expend tremendous time and energy garnering climate science data *while contributing to the climate crisis* (Mattern, 2017). When quantifiable knowledge is prised above all else, the repercussions are considered a kind of unavoidable collateral damage.

Such scientific critiques of my research are valid, within the realm of Cartesian-Newtonian science. Yet neither my research, nor my scientific pursuits, are interested in being encapsulated within a single lens. The blend of quantitative and qualitative, objective and subjective, lab and field are exactly what are needed to fully understand the impacts of, and possible resolutions for, the current climate and biodiversity crises. As Leopold (2006) scathingly wrote in regard to the natural sciences, "Science has no respect for the land as a community of organisms" (pp. 277–278). Lab-based quantitative science has its place; my hope is for such research to be more fully informed by ethics, reciprocity, and Indigenous worldviews.

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What might this look like? Ecofeminist and science studies scholar Donna Haraway recognises the importance of an interdisciplinary biology, integrated "with many other communities of practice, made up of entangled humans and others, living and not" (as cited in Gane, 2006, p. 133). She devotes a chapter to lab animals in her book, *When Species Meet* (2007). While acknowledging that suffering and killing can be justified in experimental animal labs for the greater good, Haraway also claims we need to do more than limit cruelty in labs. We need to question lab inequalities, wrestle with moral discomfort, and avoid taxonomic hierarchy. Somewhat contradictorily, she supports banning many types of experiments on apes, and certain other animal species. Both nonhumans (her word) and humans are subjects, and neither should be strictly objectified or oppressed. She asks, "How can the multispecies labor practices of the lab be less deadly, less painful, and freer for all the workers?" (2007, p. 77) and "What happens if experimental animals are not mechanical substitutes but significantly unfree partners, whose differences and similarities to human beings, to one another, and to other organisms are crucial to the work of the lab[?]" (p. 72). However, the anthropocentric lab environment renders this acutely problematic. As Haraway's colleague Sharon Ghamari-Tabrizi wrote,

> In the lab, not only is the relationship unequal and asymmetrical; it is wholly framed and justified, legitimated, and meaningful within the rationalist materials of early modern humanism. Why? Because it is conditioned on the human ability to capture, breed, manipulate, and compel animals to live, behave, die within its apparatus. (Haraway, 2007, p. 86)

Haraway's justification of the use of other-than-human animals in experiments is not surprising, since biological scientists like myself and Haraway (who has a PhD in biology) are trained in the utilitarian use of 'nonhuman' animals. The removal of animal experimentation is on par with grounding airlines to mitigate climate change or shutting down factory farms for meat production. That is, it's a paradigm shift that requires re-evaluating our fundamental beliefs and redesigning our deeply ingrained cultural practices.

Indigenous approaches to teaching and biology research would likely condemn animal experimentation. For Kimmerer (2013a), as both a celebrated botanist and a member of the Citizen Potawatomi Nation, her science training privileged mind and body, yet omitted emotion and spirit. While she appreciates that "science polishes the gift of seeing" (p. 48), she had to eschew her worldview where plants were "teachers and companions to whom I was linked with mutual responsibility" (p. 42), supplanting her native language with the scientific. We might consider the questions Kimmerer (2013b) poses regarding scientific inquiry being guided by Indigenous philosophy, including:

> "Have all the research subjects, human and non-human, given their permission to be investigated?" (p. 68).

The Cree and Ojibwa of northern Ontario view animals "as persons in their own right and are treated accordingly" (Driben et al., 1997, p. 101), respecting wildlife "not on scientific-commercial considerations, but rather on spiritual, cosmological, and ethical ones" (p. 102). Other-than-humans and humans are governed by the same ethics. Kymlicka and Donaldson (2015) suggest that some aboriginal groups denounce the instrumental view of animal species. Being "agents capable of co-authoring human-animal relations" (p. 166), any teaching or research done with nonhumans should be holistic in nature, in native habitats without suffering or killing. If we engaged in Goethean science, a delicate empiricism seen as a conversation with nature (Holdrege & Talbott, 2010), we might ask "Am I causing too much harm?" or "Have I violated this other?" As a settler-scholar, I need to situate myself in relation to the environment, and consider "*not doing* certain types of research" (Stinson et al., 2020, p. 13).

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Ecology science defines a 'community' as multiple species interacting — via interspecific interactions, food webs, and energy flow — within a particular habitat. As the science of relationships, ecology follows threads of connection that, for instance, connect sunlight to licorice fern, to aphids, to dragonfly, to belted kingfisher, to soil microbes. The species that make up this community are always researching each other: sensing, consuming, flowing radiant energy into chemical bond energy into thermal energy, and co-evolving into future generations.

Such biotic community-based research can be intrusive through predation and pathogens. One species of fungal spore spears itself into a single conifer leaf cell. This tiny spore waits until the leaf host dies, meaning five years pass before the maturation and release of new spores (Luoma, 2006). There is a reluctance to harm its host. In fact, this fungus will attack defoliating insects, thus *protecting* the tree. As a human researcher, we can learn from this fungus, to create human ecosystems that are inherently resilient (almost certainly requiring collaboration with other-than-humans), and how to inhabit the patience of a fungal spore.

I began reading the *Ecology of Wisdom*, a collection of Arne Naess essays, shortly before I hiked to his cabin, Tvergastein, near Ustaoset in Norway. For Naess, I imagine this place was a co-researcher. For without Tvergastein, there would likely be no deep ecology; or at least, in a different place, his environment-infused philosophical thought would have birthed an alternate vision. If Naess were in the Gulf Islands off the west coast of Canada, perhaps his deep ecology would embrace the oral storytelling of Coast Salish peoples, or represent the Western red cedar's seemingly immortal stature as part of his ecology of wisdom.

6. Where is my research maintaining anthropocentric forms?

Like a root-riven driveway, my research, at times, subconsciously tries to roll everything flat. What's more anthropocentric than the three letters PhD? Maggie MacLure (2017) writes how epistemological habits are hard to break, and that "we continue to underestimate the sheer difficulty of shedding the anthropocentrism that is built into our world-views and our language habits. We find it hard to *practice* critique and analysis on terms other than mastery" (p. 56). Similar to Tim Ingold, she argues for a new materialism methodological approach that rethinks and synergizes our entanglements with bodies and other beings.

Leanne Simpson (2017) speaks of an "ecology of intimacy" (p. 8) based on connective relationships without oppression where we "Privilege the relationship over the tool" (personal communication, Oct. 17, 2019). As an Indigenous scholar, she promotes "land as pedagogy" and laments the weeks where she spends sixty hours staring at a screen in the pursuit of publications and other academic products. When I update my academic CV, I can't help but feel that the most meaningful and important experiences — namely, community-building, gardening, nature attunement and perhaps something akin to "friluftsliv," the Norwegian spiritual practice of 'free air life' — have no place. To de-anthropize the PhD and scholarship process would require less screens, less walls, less writing, and an embodied, relational, and intimate ecology that both works with, and in service of, the biotic community. Autoethnography fits well here, given its focus on aliveness, lived experience, and authentic representation of what it means to be human. Bochner and Ellis (2022) explain that autoethnography "is a genre of doubt, a vehicle for exercising, embodying, portraying, and enacting uncertainty . . . Autoethnography is not a discourse of order, stability, control, and destiny but one of ambiguity, contradiction, contingency, and chance" (p. 15). This form of qualitative research can be evocative, collaborative, and rich with experiential and spiritual meaning.

Camping alone next to a ponderosa pine, watching a black bear check Quinsam River for spawning coho, or hearing the quiet cedars punctuated by a raven wings' sharp downstroke all inform my personhood, scholarship and pedagogy. Yet the academy leaves no quarter for the spiritual. Simpson (2017) explains something akin to my process: "Meaning, then, is derived not through content or data or even theory in a Western context, which by nature is decontextualized knowledge, but through a compassionate web of interdependent relationships" (p. 156). How do

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computer screens and grey-walled classrooms fit into this compassionate web? Or do they fit at all?

My early philosophising argued for shifts in worldview, in regards to the environment, because of the benefits wrought by humankind. Colleagues pointed out this anthropocentric view, and I had to decide: could I justify my arguments where the reward for treating the world with care was for the welfare and betterment of *Homo sapiens?* My answer was no: this was not enough, since the industrial-exploitative model can strip the world of its natural resources by way of this argument. Any anthropocentrism, no matter how enlightened, leads us toward choosing humans first in the short-term, no matter the long-term cost. Put more clearly by Curry (2011), "That is what anthropocentrism offers the rest of nature: more or less enlightened, and more or less efficient, slavery" (p. 220).

7. What are the implications of this research for the natural world?

To reference Tim Ingold again, research should aim to be "modest, humble, and attentive." My research does not offer absolutes, nor do I expect conventional scientists to suddenly abandon, overnight, the harmful use of animals as pedagogical and research methodologies. What I *do* hope for is an opening to wonder, both verb and noun. Wonder at the world's beauty, and to wonder at a science education where all life holds intrinsic value, that is "valuing something not for its utility or instrumental value to us, but for its own existential integrity and legitimacy of right to *be for itself*" (Bai & Scutt, 2009, p. 95). What would science education and research look like through a more contemplative, honouring and reciprocal lens?

Our current trajectory leads to massive species extinction and ecosystem collapse. To prevent this, we need to embrace an ethics of care for all living beings. Not because an "entangled empathy" (Gruen, 2014) that fosters collective care for all species and environments is in *our* best interest, but because an ecocentric vision, where all life possesses inherent value, is the clearest path forward that preserves the collective ecological integrity. Humans need to balance the benefit of enhancing natural ecosystems — increased biodiversity, healthier environments, mitigating climate change — with necessitated sacrifices — decreased consumerism, tempered wealth, and sharing habitat. Habitat sharing can ultimately be rewarding for humans and other-than-humans, such as the dual benefit garnered by selective harvesting of sweetgrass (Kimmerer, 2013a). Goethean science has relationality and empathy built-in to its methodology, offering a fuller version of the natural world.

Further to this, "any educational conception and delivery that results in inculcation into present cultural norms" — such as a de-animated Earth and science that is competitive, individualistic, and dualistic — " . . . will do nothing to change the current trajectory nor prepare learners for the new reality" (Crex Crex Collective, 2018b, p. 59). Western culture pushes pipelines through Indigenous lands and fragile coastal waters. Education that questions cultural norms, listens to other-than-human voices, and reflects on our environmental impacts are vital. Whether we are in a sixth mass extinction event, or simply eradicating biodiversity (conservative estimates put species extinction rates at 100 times higher than natural background rates; Ceballos et al., 2015) the industrial-exploitative model is not sustainable. An education system that maintains the status quo upholds this destructive paradigm.

8. How do I deal with what seems to be the researcher's paradox — balancing being present and listening to the other-than-human against disappearing into my own thinking?

The scientific researcher listens, in a way, to their subjects. In biology, this might be mediated via a microscope, electrophoresis gel, or even the human ear. Data is collected, collated, perhaps run through a chi-square test, and presented with bias squeezed out of the process as much as humanly possible (i.e., some invariably lingers). There is little doubt that scientific researchers are present to their subjects, certainly in a rational-reductionist-analytic manner. This garners sound empirical science. Yet this Newtonian approach has carved itself out of naturalism, based on reason but omitting "the kinds of question that most urgently need asking, questions of meaning, value and justice" (Curry, 2011, p. 27). Do they really hear the heart of the other-than-human? As

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Kimmerer (2016) states, "We need to listen to the land, not merely for data, but for wisdom" (p. 49).

Being trained to view the world through specific lenses (scientific, photographic, poetic, philosophical), my pushing these lenses aside is not only difficult, it might very well be impossible. Two methods I employ to get past my brain are stillness and movement: (a) entering a more contemplative state — through breathing exercises, visualisation, or meditation — or (b) embodying the experience more fully through off-trail exploration or other tricky terrain, where my heightened senses focus on navigation, a steady handhold, the slick of algae.

I am human. This I cannot escape. My brain is conditioned to frame the world certain ways, my neurons stretched by how I was schooled, mediated by the media, and cultured in an industrial-exploitative society. Recognising how my beliefs have been contained, constrained and confined — inspired by undergraduate philosophy courses and people that challenged dominant cultural norms — was my first step toward negating conventions that actually oppose my principles.

Mindfulness practice, such as a sit spot, allow us to reflect on meaning, priority, and values. During my sacred mountain journey, I often fell into my own thinking. What time is it? Am I being productive enough? What makes ponderosa pine bark so orange? Most humans cannot turn this off. But what we *can* do is linger in a place long enough, so that we start to sink into its folds and furrows. Attune to the other-than-human world, leaf by leaf, ant by ant, noting climatic rhythms and circadian visitors. Mary Oliver (2016) speaks to the "unsolvable disharmony of such work — the mind so hotly fired and the body so long quiescent" (p. 157–158). When a place inspired a poem, can I know how much I served as vessel for the natural world, and how much was stirred forth from human memory? "We are first of all creatures of motion," Oliver (2016) says, pointing to our animality and need to search for food, shelter, and other sustenance. Yet we are also inherently creative. "The dancer dances, the painter dips and lifts and lays on the oils, the composer reaches at least across the octaves. The poet sits" (p. 157). This might explain how contemplative and creative inquiry can contextualise and deepen scholarly research. From this stillness, this work "will come sooner or later to revolution, will demand action!" (p. 157–158). Put another way, contemplation and creativity are directly tied to informed action, and this is what our current geopolitical climate demands of us.

Re-imagining teaching and research

The eight questions from *Wild Pedagogies* provide a philosophical framework for future teaching and research in the life sciences. To be implemented, many ideas in this paper require a significant shift from the current university paradigm of domination, control, and hierarchy. One path to be a wild researcher is to engage in something akin to "co-becoming" (Country et al., 2015),

> [a] conceptualization of a Bawaka Yolsu ontology within which everything exists in a state of emergence and relationality. Not only are all beings — human, animal, plant, process, thing or affect — vital and sapient with their own knowledge and law, but their very being is constituted through relationships that are constantly re-generated (p. 456).

Courses like Indigenous Perspectives in Biology — which I currently co-teach with Anthony Fernandes at Kwantlen Polytechnic University, and is grounded in reciprocity and land-based learning — offer a first step toward this seismic shift. We need decolonised and re-imagined academic spaces that allow for ecocentric frameworks that are humble, modest, and attentive where scientific research prioritises respect and responsibility alongside, even above, so-called rigour and objectivity. This obliges us to dismantle embedded anthropocentrism, and attend to and consider the more-than-human world as an ally and mentor.

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References

Bai, H., & Scutt, G. (2009). Touching the Earth with the heart of enlightened mind: The Buddhist practice of mindfulness for environmental education. *Canadian Journal of Environmental Education*, *14*, 92–106.

Beavington, L. (2024). Building an ecology of pedagogy: Art, science and poetic inquiry in the temperate rainforest. In A. Vincent (Ed.), *Poetic inquiry atlas Vol. 1: A survey of rigorous poetics* (pp. 75–89). Vernon Press.

Beavington, L., & Bai, H. (2018). Science education in the key of gentle empiricism. In L. Bryan & K. Tobin (Eds.), *13 questions: Reframing education's conversation – Science* (pp. 473–484). Peter Lang.

Berry, T. (1999). *The great work: Our way into the future*. Three Rivers Press.

Bochner, A. P., & Ellis, C. (2022). Why autoethnography? *Social Work and Social Sciences Review*, *23*(2), 8–18. DOI: 10.1921/swssr.v23i2.2027.

Ceballos, G., Ehrlich, P., Barnosky, A., García, A., Pringle, R., & Palmer, T. (2015). Accelerated modern human-induced species losses: Entering the sixth mass extinction. *Science Advances*, *1*(5), e1400253. DOI: 10.1126/sciadv.1400253.

Cepelewicz, J. (2020). What is an individual? Biology seeks clues in information theory. *Quanta Magazine*. https://www.quantamagazine.org/what-is-an-individual-biology-seeks-clues-in-information-theory-20200716

Collective, C. C. (2018a). Afterwords. In B. Jickling, S. Blenkinsop, N. Timmerman & M. De Danan Sitka-Sage (Eds.), *Wild pedagogies: Touchstones for re-negotiating education and the environment in the Anthropocene* (pp. 109–131). Palgrave Macmillan.

Collective, C. C. (2018b). On the Anthropocene. In B. Jickling, S. Blenkinsop, N. Timmerman & M. De Danan Sitka-Sage (Eds.), *Wild pedagogies: Touchstones for re-negotiating education and the environment in the Anthropocene* (pp. 51–62). Palgrave Macmillan.

Cooms, S., & Saunders, V. (2023). Poetic inquiry: A tool for decolonising qualitative research. *Qualitative Research Journal*, *24*(1), 3–22. DOI: 10.1108/QRJ-05-2023-0071.

Country, B., Wright, S., Suchet-Pearson, S., Lloyd, K., Burarrwanga, L., Ganambarr, R., Ganambarr-Stubbs, M., Ganambarr, B., Maymuru, D., Sweeney, J. (2015). Co-becoming Bawaka: Towards a relational understanding of place/space. *Progress in Human Geography*, *40*(4), 455–475. DOI: 10.1177/0309132515589437.

Curry, P. (2011). *Ecological ethics: An introduction*. Polity Press.

Driben, P., Auger, D., Doob, A., & Auger, R. (1997). No killing ground: Aboriginal law governing the killing of wildlife among the Cree and Ojibwa of northern Ontario. *Ayaaggwaamizin: The International Journal of Indigenous Philosophy*, *1*, 91–108.

Fox, K. (2008). Rethinking experience: What do we mean by this word "experience"? *Journal of Experiential Education*, *31*(1), 36–54.

Gane, N. (2006). When we have never been human, what is to be done? *Theory, Culture and Society*, *23*(7-8), 135–158. DOI: 10.1177/0263276406069228.

Grenz, J. (2024). *Medicine wheel for the planet*. Knopf.

Gruen, L. (2014). *Entangled empathy*. Lantern Books.

Haraway, D. J. (2007). *When species meet*. University of Minnesota Press.

Holdrege, C., & Talbott, S. (2010). *Beyond biotechnology: The barren promise of genetic engineering*. The University Press of Kentucky.

Ingold, T. (2013). *Designing environments for life*. In K. Hastrup (Eds.), *Anthropology and nature* (pp. 233–246). Routledge.

Ingold, T. (2018). One world anthropology. *HAU: Journal of Ethnographic Theory*, *8*(1-2), 158–171.

Ingold, T. (2019). The sustainability of everything [Video file]. YouTube https://youtu.be/2EX1r8vJ8_Q.

Ingold, T. (2024). How to imagine a sustainable world. *Acta Borealia*, *41*(1), 7–15. DOI: 10.1080/08003831.2024.2334163.

Jickling, B., Blenkinsop, S., Morse, M., & Jensen, A. (2018). Wild pedagogies: Six initial touchstones for early childhood environmental educators. *Australian Journal of Environmental Education*, *34*(2), 159–171. DOI: 10.1017/aee.2018.19.

Kimmerer, R. W. (2013a). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge, and the teachings of plants*. Milkweed Editions.

Kimmerer, R. W. (2013b). The fortress, the river and the garden. In A. Kulnieks, D. R. Longboat & K. Young (Eds.), *Contemporary studies in environmental and Indigenous pedagogies* (pp. 49–76, Sense Publishers. DOI: 10.1007/978-94-6209-293-8_4.

Kimmerer, R. W. (2016). Interview with a watershed. In N. Brodie, C. Goodrich & F. J. Swanson (Eds.), *Forest under story: Creative inquiry in an old-growth forest* (pp. 41–51). University of Washington Press.

Kopnina, H. (2017). Beyond multispecies ethnography: Engaging with violence and animal rights in anthropology. *Critique of Anthropology*, *37*(3), 333–357. DOI: 10.1177/0308275X17723973.

Kymlicka, W., & Donaldson, S. (2015). Animal rights and aboriginal rights. In P. Sankoff, V. Black & K. Sykes (Eds.), *Canadian perspectives on animals and the law* (pp. 159–186). Irwin Law.

Landman-Reiner, A. (2020). Complementing reductionism: Goethean science part 1: Qualities and wholeness. *EXPLORE: The Journal of Science & Healing*, *17*(4), 360–365. DOI: 10.1016/j.explore.2020.02.015.

Leggo, C. (2005). Pedagogy of the heart: Ruminations on living poetically. *Journal of Educational Thought*, *39*(2), 175–195.

Lehrer, J. (2010). Breaking things down to particles blinds scientists to big picture. *Wired.com*. https://www.wired.com/2010/04/st-essay-particles

Leopold, A. (2006). On a monument to the pigeon. In C. D. Meine & R. I. Knight (Eds.), *The essential Aldo Leopold* (pp. 277–278). University of Wisconsin Press.

Leopold, A. (2013). Natural history, the forgotten science. In C. Meine (Ed.), *A sand county almanac and other writings on ecology and conservation* (pp. 411–415). Library of America.

Luoma, J. (2006). *The hidden forest: The biography of an ecosystem*. Oregon State University Press.

MacLure, M. (2017). Qualitative methodology and the new materialisms: "A little of Dionysus's blood?". In *Qualitative inquiry in neoliberal times*. Routledge.

Mattern, S. (2017, November). The big data of ice, rocks, soils, and sediments. *Places Journal*. DOI: 10.22269/171107.

Næss, A. (2008). *Ecology of wisdom: Writings by Arne Næss*. Counterpoint.

Oliver, M. (2016). *Upstream: Selected essays*. Penguin Books.

Pickering, L., & Kara, H. (2017). Presenting and representing others: Towards an ethics of engagement. *International Journal of Social Research Methodology*, *20*(3), 299–309. DOI: 10.1080/13645579.2017.1287875.

Rose, D. B. (2017). Connectivity thinking, animism, and the pursuit of liveliness. *Educational Theory*, *67*, 491–508. https://doi-org.ezproxy.kpu.ca:2443/10.1111/edth.12260.

Savage-Rumbaugh, S., Wamba, K., Wamba, P., & Wamba, N. (2007). Welfare of apes in captive environments: Comments on, and by, a specific group of apes. *Journal of Applied Animal Welfare Science*, *10*(1), 7–19. DOI: 10.1080/10888700701277261.

Simpson, L. (2017). *As we have always done: Indigenous freedom through radical resistance*. University of Minnesota Press.

Singer, P. (1975). *Animal liberation: A new ethics for our treatment of animals*. New York Review.

Stinson, M., Grimwood, B., & Caton, K. (2020). Becoming common plantain: Metaphor, settler responsibility, and decolonizing tourism. *Journal of Sustainable Tourism*, *29*(2-3), 1–19. DOI: 10.1080/09669582.2020.1734605.

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