A Measure for All Measuring
The Need for Wild Ethics in the Technological Era

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ABSTRACT

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A Measure for All Measuring: The Need for Wild Ethics in the Technological Era
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As humanity has inadvertently become an increasingly powerful global and geological force, there is a pressing need to reevaluate the roles of science and technology, not only in their social implications, but in their effects on wild nature—everywhere from the remaining vestiges of landscapes protected as parks and wilderness, to the wild creatures that live drastically reshaped lives in urban centers, to the global atmosphere and cryosphere. Key to this reappraisal are design and management, each of which have been somewhat neglected and underappreciated subjects of theoretical consideration. Climate change, including the prospect of geoengineering, along with the increasingly acute paradox of managing dynamic, self-directed landscapes, reveals the key role of deliberate design in shaping the global future. Our rapidly changing world beckons not only for a reappraisal of design as a crucial virtue in shaping the future of the entire spectrum of relatively humanized and wild components of this planet, both organic and inorganic, but for a reevaluation of the basis and possibility of ethics insofar as modern ethics, like modern thought more generally, is innately technological and thus implicated in technocracy.

This dissertation offers new prospects for ethics, which are not simply an outgrowth of Enlightenment, humanistic theoretical ethics, but rather of critical reflection on science and technology—particularly those aspects of each that directly study or impact wild nature; of direct and sustained encounter with protected areas—from the perspectives of both management and aesthetics; and grounded in the concrete realities of scientific practices in the field and in managing wild nature. The latter consideration includes two primary case studies: the history and ongoing challenges of wilderness and wildlife management, and discourses of the cryosphere. Wild ethics gives new, vital perspectives on our designed and managed future.

DEDICATION

To the wild ones.

"The land (and ocean) retains an identity of its own, still deeper and more subtle than we can know. Our obligation toward it then becomes simple: to approach with an uncalculating mind, with an attitude of regard. To try to sense the range and variety of its expression—its weather and colours and animals. To intend from the beginning to preserve some of the mystery within it as a kind of wisdom to be experienced, not questioned. And to be alert for its openings, for that moment when something sacred reveals itself within the mundane, and you know the land knows you are there."

—Barry Lopez, *Arctic Dreams*

Photo by Chris Dunn

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INTRODUCTION

"The real problem [is] what the human species is to do with this earth." —Olaus Murie (1960a)

This dissertation follows two main arcs: the first begins with a critique of modern theoretical ethics, culminating in an outline for an ethical approach that is experiential and attentive to the moral significance of how the world is addressed in ethical discourse—a wild ethic (Chapters 1 and 7 primarily). The second is a critique of modern science as a foundation for environmental management and modern thinking more generally, including ethics, culminating in an appeal for deliberate attentiveness and robust representation of experience to ground scientific inquiry and environmental management (Chapters 2–6 primarily). These two arcs are united in an overall critique of technological thinking—in knowing, in ethics, and in our fundamental interactions with nature—and in identifying a parallel diagnosis of deficiency between modern knowing and ethics, and a parallel palliative.

This dissertation is organized as follows. It begins with a critique of modern theoretical ethics in the first chapter, assessing it as essentially technological. The second chapter outlines two case studies focused on wildlands management and the global cryosphere as a symbolic proxy for planetary environmental management. The wildlands example includes a historic rivalry between two management approaches: one innovated by the Craighead brothers based on Cold War surveillance technology, another by the Murie brothers who insisted on embodied encounter and a non-interventionist approach. The following three chapters (3–5) take up the underlying conflict between these approaches and trace each back into a lineage of thought centered on a fundamental distinction between what I call technics and poetics. Chapter 6 applies poetics to contemporary management contexts, while Chapter 7 returns to ethics as a final application of poetics in seeking an ethics that escapes from technological thinking.

What motivates this dissertation is the hope, however dim, of maintaining wild nature in the face of rapid technological and global environmental changes. The practical and conceptual challenges of this are so immense as to require a radical reevaluation of paradigms of environmental science, ethics, and management. There are assorted, well-considered reasons for this reevaluation as well.

My intent here is not to argue for or against preserving non-human nature or free-flowing evolutionary processes that have persisted on the planet since the emergence of life around 3.5-billion years ago. I have previously given something of an argument for the need to take wildness into account in and beyond wilderness, including in our daily lives and in how we construct our artifactual world (Dunn, 2009). One takeaway from this prior work is that wildness is everywhere, but not all in the same way. There is a spectrum of the wild from the radical wild—the incomprehensible, uncontrollable, and uncared for—to managed wilderness, to a clinical or laboratory setting.

I do not agree that we live in a post-wild world and thus ought to treat the earth as a garden and nothing more, nor that the scale and seriousness of our inadvertent impacts implies that we have no choice other than to give in entirely and unregrettably to the full potential of our technological might and our presumed capacity for control. The debate over wilderness has lasted for decades and will likely continue. I encourage interested readers to seek out the ample literature on this topic[1]. For the purposes of this dissertation, I assume that preserving wildlands and an element of wildness in our world beyond formally protected areas is important and necessary, with wilderness in its "traditional" (particularly American) form as just one instance of this protection—an imperfect, yet commendable, response to imperfect times. My focus instead is on what that means and how it might be possible.

Ultimately, this dissertation is a performative contradiction as it is arguing against itself, using a form and style contrary to what it seeks to advance. In other words, it is not itself wild ethics, but it prepares the way.

[1] See for instance (Callicott & Nelson, 1998), (Dunn, 2009), and (Woods, 2017).

Chapter One: The Deficiency of Modern Ethics in the Technological Era

> "Much thinking about ethics is constrained by homage to simplistic Enlightenment values in much the same way as is thinking about technology or policy."
> —Braden Allenby and Daniel Sarewitz (2011)

To show the need for wild ethics, I will outline a set of failings of modern theoretical ethics, the primary theme of which is that technology—broadly construed to incorporate the insights of foundational philosophy of technology critics like Martin Heidegger and Jacques Ellul that technology is more than simply external devices and includes aspects of our thinking and apprehending the world—challenges ethics in unprecedented ways. Furthermore, this deficiency of modern theoretical ethics to effectively grapple with technology is partly due to some of its foundational commitments to Enlightenment ideals—modern ethics is itself technological. As Heidegger would have it, "modern science is not simply the foundation of technology, but rather the basic form of technological thinking" (Glazebrook, 2000, 12). And modern ethics, insofar as it accepts the criteria of knowledge and explanation set out by modern science, shares this "basic form of technological thinking."

In this chapter, I rely heavily on philosopher and technology critic Albert Borgmann's overarching synopsis of contemporary ethics and his analysis of technology to show the need for what he calls real ethics. My critique of modern ethics, based partly on Borgmann's, is an important component of a more comprehensive critique of modernity as it manifests in various aspects of contemporary life that affect wild nature, to include science and management, each of which I will consider in later chapters. Many of the themes that emerge in these criticisms will form the basis of the final chapter outlining select characteristics of wild ethics.

To understand the emergence of modern ethics, the intellectual ambitions of the Enlightenment must be considered. I thus provide here three primary characteristics of Enlightenment aspirations.

These are generalizations—no doubt there were historical outliers and that other characteristics can be identified—but these are sufficient for my purposes.

1) The true and the good can be discovered apart from tradition, analytically, based on the foundations of pure reason or rigorous empirical methodology. Explanations for each can be both universal and precise. The Enlightenment was in important respects a reaction to the scholasticism and dogmatic religious traditionalism of Medieval Europe. As such, abstract reason was heralded as a revolutionary alternative.
2) The true and the good can be deduced from the comfort of an armchair, without substantive engagement in the world. This is best epitomized by Descartes's *Meditations*, which takes place in his closed chamber. However, even a radical empiricism, which values the sciences highly, as a *philosophical approach* is still "armchair philosophy" insofar as it emphasizes rigorous thought over sensual and material engagement. Kant, who is often said to have bridged empiricism and rationalism, nevertheless "considered the world of the senses unreliable if not treacherous. His foundation of morality is not a sense or feeling but a principle of practical reason" (Borgmann, 2007, 48).
3) Human beings are idealized as rational, free, and equal; capable of obtaining a comprehensive scientific understanding of the world and acting in accordance with it; and of creating democratic institutions founded on the basis of this insight.

Among many contributors to this emerging worldview, Thomas Hobbes, Rene Descartes, and Francis Bacon loom large, each of whom will feature at some point in my analysis, but I mainly will focus on Isaac Newton and Galileo Galilei, who together revolutionized science and in the process set the modern standard for explanation (Glazebrook, 2000, 69). Galileo, through his experimental and mathematical formulation of physical phenomena "established modern theory as the standard of

insight." Thereafter, explanation required rigorous theory of a certain type: "an explanatory account that centers on laws, principles, or rules." (Borgmann, 2007, 46). Newton would take up this mantle and create a mechanical paradigm of explanation. To understand the world is therefore to explain it in mechanical, mathematical terms. Thus, "lawlike theories [nomological-deductive] set the modern standard of explanation and insight" where "the laws of physics are the epitome of what we expect at the center of a theory, laws of universal scope, rigorous precision, and illuminating force" (Borgmann, 2007, 87).

The development of modern science had implications for all forms of inquiry, including philosophical ethics. Analytic philosophy—the dominant form of philosophy in the English-speaking world—including ethics, has largely adopted the model of the sciences—physics in particular—for what counts as a rational explanation (Frodeman, 2003, 8+83; Borgmann, 2007, 47).

The allure of this approach is understandable—a comprehensible, rational world that can be understood by rational minds is comforting. However, there are significant downsides to adopting such a view. Reality must be simplified to fit into Enlightenment conceptual apparatuses. Universal principles for all times and places are alluring but must be thin or false. The kind of precision sought in analytic philosophy may range from irrelevant to impossible when attempting to describe reality in a meaningful way. After all, Aristotle long ago warned against "the inappropriate hankering after precision in ethics." Likewise, Heidegger "criticized the pretensions of theory to incisive understanding and beneficial guidance" (Borgmann, 2007, 29).

My criticisms of modern ethics are primarily centered on theoretical ethics (normative ethical theory rather than metaethics). This is something of a contradiction as all ethics is meant to be practical insofar as it is meant to guide human action, while practical ethics relies at least to some degree on theoretical tools to make its case. However, much ethical thinking operates at the level of pinpointing

what type of ethical theory appropriately justifies an action in general, as opposed to starting with the real-world necessities of decision making, as does practical ethics.

Theoretical ethics is only one major type of ethics alongside applied, practical, and what Albert Borgmann calls real ethics. Applied ethics attempts to apply the theories developed in theoretical ethics to concrete situations, whereas practical ethics deemphasizes theory and focuses on concrete situations themselves as the starting point, while bringing in theory later to guide decision making. Real ethics focuses on the everyday material realities that constrain ethical behavior, broadly construed to include the good life and excellence. I will return to real ethics later in this chapter and in my discussion of wild ethics in the final chapter.

There are likely countless ways to parse out theoretical ethics, but two theories loom larger than all others: deontology and consequentialism. Following Albert Borgmann, I include virtue ethics and evolutionary psychology as two further major approaches, thus resulting in four basic types of modern normative ethical theories. I am less concerned with the content of each of these ethical theories as with their form—what is considered an appropriate explanation. The schools of deontology and consequentialism might be thought of as something like bickering children, as despite a centuries old intricate debate between them, they are the products of a common Enlightenment parentage and thus their commonalities far outweigh their differences. This is evident in their shared commitments to certain standards of explanation and rationality.

Collectively, these four major schools of theoretical ethics provide moral landmarks—broad and indispensable—"rough bearing[s], but…leav[ing] the regions of daily life unmapped." (Borgmann, 2007, 51). Borgmann thus calls for a real ethics, as a critical addition to theoretical and practical ethics—a possibility I will turn to at the end of this chapter.

First, I provide summaries of ten failings of modern normative ethical theories, most focused in some way on shortcomings in accounting for technology and its impacts in the world.

Ten Failings of Modern Ethics

Of these ten failings, eight are directly concerned with technology, while the last two indirectly share this concern. I focus here on failings and thus, in Socratic fashion, begin to define wild ethics in terms of what it is not. A more positive formulation of wild ethics will follow in the last chapter, following and expanding on many of the themes outlined below. The first two failings I identify are intertwined and described by philosopher Albert Borgmann in his book *Real American Ethics*. Many of these use specific examples that are meant to illustrate larger trends in ethical thinking.

1) Failure to account for excellence and the good life (technology 1)

Albert Borgmann, in assessing American culture, points to significant positive highlights, like general decency and tremendous cultural achievements accessible by a relative few, in contrast with large swaths of American life that are defined by misery and mediocrity, characterized by features like obesity, civic decline, and excessive devotion of time to unskilled entertainment like television. This is due, in his prognosis, to a flaw in liberal theories like those of John Rawls to overlook non-moral in favor of moral excellence, though Borgmann's analysis also challenges this moral-nonmoral divide.

Predominant ethical and liberal theories harbor skepticism that a common good life or standard of excellence can be defined without unnecessarily restricting liberties. Deontologists deny that we can define a common good life without impinging on the rights of individuals, utilitarians assume that it is happiness or pleasure, while even Rawlsian conceptions of justice are focused on the social rather than the material makeup of our world—attentiveness to the latter critical in enabling excellence. Virtue ethicists have also neglected to fully define a conception of the good as they have been too preoccupied in negating rival theories (Borgmann, 2007, 157-8).

Theoretical ethics thus provides the landmarks of moral life, but alone gives only an impoverished view that is "inconsequential and inconclusive as regards the quality of our lives" (Borgmann, 2007, 30). Non-moral excellence must be taken seriously as "what was once the privilege of the aristocracy is now an obligation of democracy" (Borgmann, 2007, 198). The good life should minimally consist of an appreciation of beauty and attention to what Borgmann calls Churchill's Principle—a philosophical application of Winston Churchill's observation that "we shape our buildings, and afterwards our buildings shape us"—a principle to which I will return repeatedly in this dissertation. This neglect of excellence and the good life is thus deeply related to a neglect of material conditions, which I will take up in the second critique[2].

2) Failure to account for the material conditions of everyday life (technology 2)

Key to understanding the first critique Borgmann levels against theoretical ethics is the failure of mainstream ethics to consider the composition of our artifactual and material environment as a substantive moral concern. The typical ethical view is that life takes place on an empty stage whose props do not matter. Or when material conditions are considered, as in environmental justice for instance, the focus is on fair distribution rather than a substantive consideration of the composition of daily life. Physical excellence, like human excellence, has also been neglected. However, as technology has become increasingly powerful and ubiquitous, this view has become problematic.

Churchill's Principle reveals that material environments create tendencies in human conduct and flourishing. While individual resolve is also important, most people are unable to overcome these

[2] Likewise, following criticisms by Alasdair McIntyre of modern ethics, Lawrence Schmidt's and Scott Marratto's *The End of Ethics in a Technological Society* points out that the "privatization of the good" has led to an untenable situation in which society functions with a "non-ethic" or "new ethics" in which the public good is shaped according to utilitarian standards, while the private good is thought to have no basis except emotivism because "contractual liberalism asserts that reason cannot tell us what our true end is or how to reach it" (Schmidt & Marratto, 2008, 155). Alasdair McIntyre calls this "bureaucratic individualism"—a state in which modern ethics and liberalism, including rights theories, have essentially failed, leaving technological progress as the only collective good. Liberalism is a tradition that subverts others and eliminates any public sense of the good, replacing it instead with "a monolithic certainty about excellence—namely that the pursuit of technological efficiency is the chief purpose for which the community exists" (Schmidt & Marratto, 2008, 157).

environmental dispositions. Talent, for instance, requires material circumstances conducive to development and discipline to become excellence. Unfortunately, despite latent potential, the material conditions of contemporary America are not so arranged (Borgmann, 2007, 97).

Key to understanding Borgmann's views of the relationship between material conditions and excellence is understanding what he calls the device paradigm—the pattern by which technology operates and regulates contemporary life, splitting the world into visible commodities and invisible machineries[3] (1984). The device, in procuring a commodity pulled from its moorings and obscuring its origins, can intensify the environmental and social costs of contemporary society. Technology, in Borgmann's view, thus has two major, often-overlooked implications: channeling typical human behavior and acting as an anesthetic—a "cocoon of comfort and indifference"—from misery: the suffering of others and the degradation of the environment (Borgmann, 2007, 158).

Borgmann's prognosis for remedying this neglect of the good life and the ramifications of technology is that we must both incorporate focal things and practices—moments and events that reorient us in time and space—into our lives, and account for Churchill's Principle by applying design to our private as well as public spheres since "public space, no less than the domestic sphere, is distorted and in disarray" (Borgmann, 2007, 186).

Just as the design of our households are not conducive to excellence, the design of our public spaces has been neglected—from America's crumbling infrastructure to the severe modern architecture of many of our buildings to the neglect and abuse of the global atmosphere—design has so far failed to bloom into a political virtue. We have failed to account for "the newly quantitative and the newly

[3] A home's central heating unit, for instance, provides the commodity of warmth at the push of a button, in contrast to the traditional furnace, which was prominently located at the center of the house—demanding attention and skill for its operation. It not only provided warmth, but necessitated engagement, thus centering daily life. In exchange for safety and convenience, devices cut us off from engagement with the world, leaving only vacuous consumption. Commodification in this sense is moral commodification wherein "a thing or a practice…detached from its context of engagement with a time, a place, and a community…becomes a free-floating object" (Borgmann, 2007, 152). This can, but need not necessarily, overlap with economic commodification, wherein a thing or practice is brought into the market.

qualitative dimensions of stewardship"—the global "task of stewardship, as a creative enterprise" (Borgmann, 2007, 130).

In sum, mainstream theoretical ethics, and ethical variants like professional ethics, have failed to take the design of the material environment into account—both our artifactual, technological world and the natural environment.

3) Failure to substantively restrain technological development (technology 3)

> "The use of technology, uninformed by the wisdom of proper human ends, and untampered by an appropriate humility and awe, can unwittingly render us all less than human."
> —Leon Kass (1985)

In *The End of Ethics in a Technological Society*, religious ethicist Lawrence Schmidt and philosopher Scott Marratto demonstrate theoretically and through several case studies that technology has subverted any substantive and consistent restraint that modern ethical theory can offer. I focus here on their account as it nicely encapsulates this critique. In their words, there is great…

> inadequacy and inconsistency (and implicit moral nihilism) [in] contemporary discussions of many pressing ethical issues on their own terms. Neither utilitarianism nor any of its variants (rights theory, consequentialism, contractualism, pragmatism, etc.) offer any solutions to the moral dilemmas that we face in the technological society (Schmidt & Marratto, 2008, 166).

Technical necessity, e.g., the internal logic of global economic institutions or medical science, overrides any substantive ethical reflection—an essentially nihilistic outcome. This is due not only to the shortcomings of modern ethics, but the unrelenting necessity of formulating codes of conduct and making everyday decisions in professional contexts in the absence of any coherent or adequate theory.

An important component of their critique is aimed at the calculative nature of modern ethics, an outcome of the aspirations of ethics to Enlightenment standards of explanation. This equivocation of ethics and calculation is also evident in the predominance of risk analysis over ethics—an issue I will return to in the following critique. Modern ethics calculates but does not ask substantive questions: "the

ethical questions that could impel us to acknowledge our ignorance can never seriously be raised. They are viewed as irrelevant if they would slow down the technological project" (Schmidt & Marratto, 2008, xiv). These fundamental questions concern human ends or those of nature. This neglect is the result of the Enlightenment dismantling of the natural law tradition rooted in Aristotelian teleology—a kind of transcendental moral realism—wherein meaning and purpose can be discovered by philosophical reflection and right action is action in accordance with the order of the universe.

However, "Enlightenment faith entailed a trust in reason, but reason was gradually reduced to positivist, experimental science" (Schmidt & Marratto, 2008, 149). This loss of the natural law tradition (not to be confused with physical laws of nature) has been key to the loss of orientation and acceptable limits on human creativity and thus the transformation of our bodies and nature. There is no longer any order to attune ourselves to and thus no clear limits to manipulation[4]. The loss of the natural law tradition reduces the collective good to technological progress, thus modern politics rooted in contractual liberalism not only denies natural law but becomes itself a kind of technology, which assures that the "imperatives of technology must trump ethical concerns" (Schmidt & Marratto, 2008, 150).

Modern thinking has transformed the meaning of history (and thus the purpose of human life) into a utopian, history-making spirit, which unleashes human passions and creativity and believes that all external manifestations of evils can be eliminated. This sense of history rests on an unwarranted faith in progress. While "the origins of Western faith in technology are obscure," it was surely solidified

[4] This point is well summarized by philosopher Robert Frodeman: "even before the death of natural theology, philosophers were seeking a noncosmological basis for ethics—Kant in the ethical implications of pure reasoning, Bentham and Mill in pleasure and pain. For all their differences, what united these theories was the sense that there was no point in looking to nature for a normative principle. Nature modeled nothing except utter randomness. Physics and ethics, the material universe and the good life, lost their connection. More recently, the loss of nature as a normative principle has encouraged a proceduralist approach to ethics. No longer having rational access to what is right, the right has become whatever results from following a set of rules. Contemporary ethics means engaging in the proper process, rather than the training and cultivating of the soul. It is the triumph of process over results. Once we deny the possibility of identifying a common good to our lives, all that remains are rules and procedures. The question of what constitutes the good life is now a private issue—private by default, because the question is not subject to rational debate" … "the main concern of natural philosophy was not with what we call nature (rocks, animals, ecosystems), but with the natural. The natural order of things possessed prescriptive and proscriptive force: the way things were implied the way things were supposed to be" (Frodeman, 2003, 44; 43).

during the Enlightenment when progress supplanted Christian providence. Remnants of Christian eschatology however continue in the modern idea of progress.

Schmidt and Marratto identify four prominent examples of technology subverting ethical considerations: international development, nuclear energy, weapons technology, and procreation and birth control. I provide brief summaries here to demonstrate the empirical reality of the shortcomings of ethical considerations in restraining technological development. I will return briefly to nuclear energy in the following critique.

In international development, technical necessity overrides ethical reflection within the policies of global financial institutions like the World Bank and International Monetary Fund. Meanwhile, Enlightenment faith in progress is carried on by international corporations, which function as autonomous technical structures. Simple transfer of technology attempts at development have not been successful, and global poverty and inequality, resulting in rural destitution and uncontrolled urban growth, is still an enormous issue. This outcome is likely not due to deliberate greed, but to adherence to technical disciplinary paradigms, particularly economics. As economist Herman Daly observes:

> "My major concern about my profession today is that our disciplinary preference for logically beautiful results over factually grounded policies has reached such fanatical proportions that we economists have become dangerous to the earth and its inhabitants" (Schmidt & Marratto, 2008, 31).

The very notion of development can also be construed as a technical substitute for justice[5].

Similarly, they find any conception of just war theory, a cornerstone for western ethics since antiquity[6], has been subverted by the requirements and allure of modern weapons technology. This subversion is encapsulated by a comment made by a WWII era U.S. undersecretary of war: "We will

[5] Though in my deeper (forthcoming) analysis, justice itself, at least in its modern manifestations, can be thought of as inherently technical.

[6] This is obviously not a modern ethical precept since it is rooted in antiquity, but it has been analyzed and refined by proponents of both deontology and consequentialism. This case is nevertheless still a useful example of the power and ubiquity of technological thinking of a certain type.

make our plans to suit our weapons, rather than our weapons to suit our plans" (Schmidt & Marratto, 2008, 79). Using the examples of nuclear and precision weapons, they show that this reasoning is also true of ethical considerations: weapons are not designed to uphold just war theory, but rather justifications for the development and use of weapons are formulated after the fact.

The atomic bomb is a weapon of disproportionate and indiscriminate destruction, thus inherently violating the two basic precepts of just war theory. It followed earlier such uses of chemical weapons and carpet bombing of civilian centers during the World Wars. The development of such a weapon required several precarious justifications: scientists had to reach somewhat arbitrary conclusions about the level of acceptable risk of "lighting the atmosphere on fire," while the wartime necessity was questionable (in the authors account, contrary to more common interpretations, the Nazis had failed to develop the bomb, yet the Americans persisted despite this known failure); rather Oppenheimer gives this justification: "When you come right down to it, the reason we did this job was because it was an organic necessity. If you are a scientist, you cannot stop such a thing" (Schmidt & Marratto, 2008, 89), while he deemed the development of the hydrogen bomb "technically sweet" (Schmidt & Marratto, 2008, 91). The development of the bomb was followed first by its use on Hiroshima and Nagasaki, each chosen for their lack of war damage in order to best scientifically measure the effects of the bomb, and later by the Cold War doctrine of mutually assured destruction, revealing the "implicit nihilism of technocrats" (Schmidt & Marratto, 2008, 92).

The more recent development of precision-guided munitions is thought by some to uphold liberal values, for instance by minimizing civilian deaths, but in fact, Schmidt and Marratto maintain, our plans still suit our weapons. Civilians are still killed and high-tech aerial warfare technology takes precedence over considerations of the underlying background conditions of terrorism in the 9/11 era. This form of weapons technology, like the atomic bomb, was not designed to uphold just war theory.

Schmidt's and Marratto's is at least one compelling account demonstrating that on multiple fronts, technology subverts any substantive and consistent ethical restraints[7]. There are thus significant reasons to doubt the efficacy of modern ethics as a continuation of the Enlightenment project.

4) Failure to overcome "methodological reason" and technological thinking (technology 4)

"The loss of nature as a normative principle has encouraged a proceduralist approach to ethics. No longer having rational access to what is right, the right has become whatever results from following a set of rules." —Robert Frodeman (2003)

I outline here two perspectives on this externalization and methodization of ethics: a) ethics has been supplanted by calculation—especially risk analysis, and b) professional ethics in particular has been supplanted by methodological reason.

***a) Ethics has been supplanted by calculation—especially risk analysis*.**

While philosopher Robert Frodeman above assesses rule-based ethics as procedural, which could be understood as itself a kind of calculation, the calculative nature of modern ethics is most evident in utilitarianism and risk analysis.

Utilitarianism often self-consciously utilizes a calculative method—a "utilitarian calculus." Consequentialism in general, even as it has branched out from classic utilitarianism, still shares this

[7] Their final example is the creeping return of positive eugenics as a means of deliberate genetic improvement of humanity. The original dream of positive eugenics was rooted in utopian socialism and progressivism, which sought to apply the Enlightenment belief in perfectibility to the human body. It later lost favor after it was appropriated by the right (Schmidt & Marratto, 2008, 141). A growing new eugenics based on consumer preference rather than the whims of totalitarian regimes has begun to creep into procreation through genetic abortions (in utero testing for less desirable genetic conditions resulting in abortion), and thus what began as compassionate concern for the infertile will end with eugenics.

The medical professions have not waited for an answer to the simplified questions "what are the limits to our rights to conceive, bear, abandon, or kill human offspring?" but have instead proceeded with research and procedures, "generally…guided by the technological imperative 'What can be done should be done'" (Schmidt & Marratto, 2008, 116). Procreation has thus been reduced to a technical procedure in which serendipity is replaced by active planning, and the right not to make a choice is eliminated.

The authors worry that procreative technologies, including indirect forms of eugenics may lead to "voluntary self-degradation or willing dehumanization," which at this point in history, may be a greater threat than totalitarian technical control (Schmidt & Marratto, 2008, 128).

Though feminist thinkers have written critically about select procreation technologies like in vitro fertilization, the authors conclude there are no clear and consistent feminist principles provided to restrict the deployment of these technologies and that ultimately even critical feminists cave under liberalism's technological mandate.

calculative foundation (shifting into for instance rule-based variants). Utilitarianism's methodology typically proceeds by seeking a common objective measure enabling comparison, calculation, and maximization of total happiness or pleasure. The difficulty of finding an objective measure has often resulted in happiness being translated into economic terms, such that economic livelihood roughly equals happiness. Whatever the measure, the fundamental aspiration is reductive and distorting of reality with its great diversity of irreducible goods and tremendous complexity in real-world decision making.

As noted above, Schmidt and Marratto argue that "the modern liberal account of reason is calculation" (2008, 161)—modern ethics is calculative, sharing a modern essence with epistemology and political theory. They additionally set out to show that modern ethics has been overcome by risk analysis as we now live in Ulrich Beck's risk society, wherein "the globe [is] the laboratory for its experiments" (2008, 76). Risk analysis, a probabilistic approach that depends on a distinction between "risk (which relies on scientific calculation of probabilities) and the acceptability of risk (which takes into account political and social factors)," is "modern ethics' last stand," offering a last small effort to reign in technology.

Risk analysis however is severely limited. In many instances, the only way to truly assess risk is to actualize a given technology. Schmidt and Marratto focus particularly on nuclear energy but provide analyses of similar dynamics in the development of the nuclear bomb, negative eugenics, and genetic engineering. Each is a reverse experiment—flipping the generally understood model of how science and technology research proceeds. Models are imperfect: "the real experiment, as Ulrich Beck explains, takes place in (and with) the real world[8]" (2008, 172). In the process, the technological imperative—that

[8] Ulrich Beck describes this dynamic as follows: "Theories of nuclear reactor safety are testable only after they are built, not beforehand…If one compares this with the logic of research that was originally agreed upon, this amounts to its sheer reversal. We no longer find the progression, first laboratory, then application. Instead, testing comes after application and production proceeds research (Beck, 1999, 26).

we should experiment to find if something is possible, and if it is, we should do it—has become equivalent with morality.

What stands out here is that when a given technology is assessed ahead of time in terms of whether it should be employed, rather than simply actualized as a real-world experiment to be assessed after the fact, this is often merely through the calculation of risk.

***b) Ethics* (p*rofessional ethics in particular) has been supplanted by methodological reason*.**

In a well-regarded analysis of the intersection of values and science policy[9], philosopher Heather Douglas suggests orienting away from theoretical ethics towards technique—thought experiments for example. This is a response (rightly) to unresolved, and probably unresolvable, debates amongst philosophers regarding the correct ethical theory accompanied by a sense that "there is not one ethical theory that can be applied to all decision contexts, producing the 'correct' values that can then be used to guide judgments" (2009, 169). Her insight is I think important, but her conclusion in off. Technique may possess a similar allure as modern theoretical ethics, but it is problematic in its own right.

A useful analysis of this methodization of ethics is given by philosophers Eric Nordenhaug and Jack Simmons in *The Outsourcing of Ethical Thinking*. They provide a critique of contemporary professional ethics, but their analysis is not limited to this subset as portions can also apply to the major schools of modern theoretical ethics. According to Nordenhaug, utilitarianism and deontology are similarly based on the same type of externalized, methodological reasoning that produces technology—mirroring Descartes' rule-based, methodological epistemology. These approaches are thus at some level inherently technocratic[10].

[9] *Science, Policy, and the Value-Free Ideal* (Douglas, 2009)
[10] Personal communication

Professional ethics can be considered a kind of practical or applied ethics, meant to be explicitly operational for experts such as medical professionals, lawyers, or engineers working in an institutional setting. Professional ethics is thus intended to function like a "social device," such as that proposed by nuclear physicist Alvin Weinberg, meant to direct behavior, including morality, in a professional setting (1967). Or like the moral compass proposed by Kant.

Kant wished to put ethics on a solid footing rather than the disparate and piecemeal "hypothetical" ethics of his day—striving for a universal, formal, lawlike principle of ethics in the manner of Newton's laws of physics. Part of this effort included his attempt to develop a compass—a device—for everyday moral life that would allow us to act in accordance with duty, such that all rational humans "with this compass in hand, would in all possible cases know how to determine well what was good, what was bad, what was in agreement with duty or against duty" (Kant, 1785, 20). This attempt, while questionable, is mainly of interest in demonstrating the technical nature of modern theoretical ethics: Kant in this case literally equated moral judgement with a device. Kant also gives a formula for right action—an algorithm—in the form of the categorical imperative in its various manifestations, each resting on a methodical application of universalization.

The two major schools of theoretical ethics, deontology and consequentialism, share a common essence—a commitment to a type of formulation that explains the good. Each aspires to formulate an ethical algorithm—"attempts to construct universalizing theories based on a few foundational principles (roughly speaking, the fewer the better)" (Laidlaw, 2014, 48)—whether Kant's device for moral decision-making or utilitarianism's calculative methodology—each directly following in the Newtonian aspirations of the Enlightenment.

This technological thinking about ethics, coupled with the institutionalization of ethics into professional codes and rules, changes one's relationship to ethics—a shift nicely summarized by philosopher Gernot Böhme:

> The external preconditions of everyday life, transformed over time into technical preconditions, have such a powerful effect on behavior that individuals can progressively feel themselves absolved of ethical constraints…this leads to…a substitution of technical norms for moral norms (2012, 5).

Methodically following externally mandated, professionally approved rules becomes "a substitute for internal moral reasoning and personal responsibility," where ethical standards are reduced to technical standards (Nordenhaug & Simmons, 2018, 1). Once this occurs in a professional setting, institutional mandates enforce such externalization.

There are several factors leading to this outcome: a general loss of humanism such that professionalism is thought to be its substitute; the equivocation of professional and human excellence; the loss of the classical sense of ethics, which includes the development of "internal, non-methodological, moral reasoning" as well as individual character and excellence; and the replacement of the "internal ethical transformation of the individual" with techniques like rules, methods, or procedures. Rules will however necessarily fail us, thus there is continued need for a "sophisticated, internal moral voice" (Nordenhaug & Simmons, 2018, 11).

Such an internal voice is more akin to a traditional sense of wisdom than a procedure. I thus conclude here with a final small aside regarding wisdom. While wisdom was once esteemed the highest virtue by classical Greek philosophers and various other traditions, wisdom in contemporary society appears anachronistic and without basis. There seems to be an unfounded hope that either a precise method or a wealth of data and information—or technology in some other form—can replace human judgement born of experience. In fact, however the key aspect of wisdom—a robust orientation to reality—is masked by technology (Borgmann, 2007, 99-102).

5) Failure to overcome abstraction and detachment in favor of the personal and transformative (technology 5)

This critique has a broader focus and application beyond ethics—particularly for analytic philosophy—though with applicability to academia more generally. It has already been prefigured, particularly in my discussion of the methodization and calculative nature of modern ethics, and the modeling of philosophical theory after modern science. For instance, Nordenhaug and Simmons noted that professional ethics in particular has betrayed the aims of classical ethics, which focus on the inner transformation of the individual, in favor of moral techniques; while Schmidt and Marratto contend that modern political philosophy breaks from classic in that a just society need not be composed of individuals who have internalized justice, thus rendering political problems technical (2018).

A technical interpretation of the role and function of philosophy, and thus of environmental ethics, is that it is a crucible for critically assessing, responding to, and innovating arguments. Environmental ethics, from this perspective, as opposed to, for instance, environmental philosophy more generally, is inherently technical. Philosopher Edward Mooney however offers a radically different possibility for philosophy and in the process a wide-ranging critique of mainstream philosophy. Mooney appeals to philosophers such as Stanley Cavell, Henry Bugbee, and especially Henry David Thoreau[11] to make his case.

Analytic philosophy is the dominant strain of academic philosophy, at least in the English speaking world, while philosophical ethics is generally analytic in its form and aspirations. It has traditionally dealt with questions of science and has simultaneously sought to model itself after the sciences. It adheres to "restrictive philosophical commitments," following the groundwork put in place by Descartes, particularly a "privilege on intense focus and propositional certainty achieved through argumentative rigor" (Mooney, 2015, xiv). This approach, in seeking a "dispassionate view from the

[11] Whom he makes the case ought to be seen as a philosopher in his own right.

top," is typically cool, disengaged, abstract, impersonal, and scientific, yet embedded in a philosophical culture that is often "adversarial public debate" (Mooney, 2009, 102).

In analytic philosophy, as in the sciences, the self and the personal are purged—moments where the elements of the world sensorially engage us so deeply that they seem to reach out and speak to us are professionally repressed—reduced to "irrelevant, embarrassingly private revelation" (Mooney 2009, 102). In this academic milieu, "certain topics are inadmissible in public debate. We are thus forced to search, often in vain, for scientific, epidemiological, economic, or legal arguments that match the intuitions that we dare not voice" (Frodeman, 2003, 40).

Mooney however identifies an alternative canon or tradition within philosophy, which he dubs personal or lyric philosophy. It operates from an implicit understanding that "arguments have limits" and is rather "non-argumentative but nonetheless philosophic thought" (2015, 34). This neglected, alternative heritage can consist of "poetic prose, unfinished essays, and writing dedicated to personal transformation" (2015, xiv), embracing embodied, poetic, literary, or self-transformational approaches. Specific works of certain prominent figures such as Rousseau, Kierkegaard, Stanley Cavell, Henry Bugbee, Martha Nussbaum, R.W. Emerson, and H.D. Thoreau can be included, as can the confessional elements in the writings of Wittgenstein, Pascal, Nietzsche, or Augustine.

Ethics in this vein is something else entirely from the dominant modern theories, virtue ethics included. Rather than seeking "an algorithm determining right action" resting "on appeals to abstract reason to disassemble into lifeless components" in turn only offering "certain abstract requirements of justice," it is instead a "struggle for intelligible expression of what we can own, of what we might believe in, of what we can be"—a struggle to find one's voice—a struggle for which the "stripped down theories from Mill or Kant or Rawls don't help" (Mooney, 2009, 124). In this way, it finds common ground with religion. This mode of ethics is grounded in perception and native sympathy, resting on "an experientially delivered relational bond," rather than reason. This is something far more substantive

than Hume's emotivism, however, reminiscent instead of philosopher Henry Bugbee's "resuscitation of the notion of moral of necessity"—focused on…

> what we *must* do, as opposed to what we should or ought to do…Bugbee's moral philosophy cuts a middle path between Hume and Kant. Hume puts sympathy center stage but finds no deep ground for its necessity—it rests simply on our longing for social approval. Kant finds a deep ground for moral response but locates it, inappropriately, in reason's law-like necessity. Bugbee works to uncover an experiential ground of felt-compassion that carries the necessity not of law but of the heart—what in reality speaks to the person as a whole. Another's suffering is real and calls not just to reason but to the very springs of wholehearted human responsiveness. An almost Buddhist sense of compassion is grounded in a necessity reminiscent of Spinoza (Mooney, 2009, 27).

I will return to Mooney's lyric-personal philosophy and an ethics grounded in perception as an important component of wild ethics in the final chapter.

6) Failure in the face of systems level uncertainty (technology 6)

"Projecting the effects of technology systems before they are adopted is not just hard but, in view of the complexity of the systems, probably impossible" —Braden Allenby and Daniel Sarewitz (2011)

The assumptions and aspirations of modern theoretical ethics have been pushed to the breaking point by rapid technological change. Enlightenment values, such as human intentionality and rationality, as well as progress and certainty—including those that form the basis of modern theoretical ethics—have become untenable due to this change. This is so in several respects: technology has drastically increased the impacts of our actions in the world, such that small actions have disproportionately large impacts, while at the same time the complexity of systems with which we interact has become ungraspably complex in time and space; meta-level systems (linked systems, and systems of systems) have emerged in which actions are impossible to trace, challenging paradigms in ethics, management, and policy; and the specific effects of technologies may not only be impossible to comprehend but also change the fundamental conditions that given technologies were intended to address. Collectively,

these changes effectively turn the world, including nature and the human mind and body, into a laboratory for technological experiments.

Small actions like turning on a light, linked through complex technological systems, now lead to massive repercussions like the production of effectively endlessly persistent nuclear waste or the fundamental alteration of atmospheric chemistry. These large-scale phenomena have been portrayed in one rendering as hyperobjects—massively distributed in space (globally) and time (deep time), effectively ungraspable, and only allow themselves to be experienced in parts rather than wholes (Morton, 2013). They thus exceed the limits of our moral imagination.

Alternatively and simultaneously, our actions have become more unpredictable as they interface with increasingly complex systems. In the *Techno-Human Condition*, technologist Braden R. Allenby and science theorist Daniel Sarewitz outline a useful framework that explains many of the fundamental flaws of typical approaches to technology and grappling with large-scale transformations.

Technologies operate on three levels, each of which entails differing system behaviors. Level I technology is the "shop-floor" level, where the effects of technologies are familiar and clear, following their intended purposes. Examples include hearing aids, fishing boats, and airplanes. Level II is "a networked social and cultural phenomenon"—the system in which Level I technologies are embedded (Allenby & Sarewitz, 2011, 63). Here emergent complexity leads to unplanned and less predictable effects, yet the components of the system are discernable, while the system as a whole has a unifying goal. Examples include deafness as a social and cultural phenomenon, the airline transport system including the economics of airlines and airline security, and fisheries. A Level III technological system is "an *Earth system*-that is, a complex, constantly changing and adapting system in which human, built, and natural elements interact in ways that produce emergent behaviors which may be difficult to perceive, much less understand and manage" (Allenby & Sarewitz, 2011, 63). Here, there is non-directed, non-predictable evolution, rather than unifying goals. Level III systems are effectively

ungraspable, non-bounded, and wickedly complex. Examples include climate change and global terrorism as an interconnected social and cultural phenomenon. Levels II and III involve environmental systems, and human actors and institutions.

A key shortcoming on the part of policymakers, technologists, ethicists, and others is confusing these levels—mistaking the simple, predictable cause-and-effect relationship of Level I technology for the wicked complexity of Level III, where "when it comes to technological systems, the connections between decisions and outcomes are so attenuated as to render any notion of ethical accountability meaningless" (Allenby & Sarewitz, 2011, 179). This makes cost-benefit analysis and assessment of future consequences all but impossible, thus undermining ethical frameworks like consequentialism.

However, they also extend their criticism to "rule-based ethical systems," which I interpret to encapsulate deontology and similar theories: "Level III systems are complex enough so that any single ethical perspective can only be partial, which means that coherent rule-based ethical systems are also of limited value, because any particular rule-based system can provide only a partial perspective" (Allenby & Sarewitz, 2011, 181). And again: "The system itself always remains more complex than what one is able to capture at any particular time, with any particular perspective" (Allenby & Sarewitz, 2011, 115). This is so because "ethics, like computer models and like worldviews, becomes partial as it becomes coherent," reflecting what the authors call an "ethical uncertainty principle" (Allenby & Sarewitz, 2011, 183).

Thus, no modern theoretical framework or ideology can stand up to the dynamic complexity of reality, whether Marxist or neoconservative ideologies; scientific management of earth and technology systems; or modern theoretical ethical frameworks like consequentialism or deontology. What each of these shares is a common commitment to Enlightenment ideals and aspirations. However, "the world we are making through our own choices and inventions…neutralizes and even mocks our existing commitments to rationality, comprehension, and a meaningful link between action and consequence"

thus making “ethical and responsible behavior as judged by outcomes in the real world…an increasingly meaningless idea” (Allenby & Sarewitz, 2011, 65+111).

Enlightenment ethics, or what I have otherwise called modern theoretical ethics, operating from the basis of “simplistic Enlightenment values,” are Level I micro-ethical approaches that are inappropriately and impossibly applied to Level III systems: “Any moral framework is incoherent if it seeks simply to extend existing ethical systems into more complex domains” (Allenby & Sarewitz, 2011, 182). The authors even dismiss Leopold’s Land Ethic and the Precautionary Principle as attempts to expand micro-ethics into Level III macro-ethics.

Furthermore, these simplifying, yet universalist-aspiring, perspectives, which attempt to prescribe ethical behavior from a minimum of rationally-derived first principles—are necessarily flawed due to the ethical uncertainty principle: their coherence comes at the expense of partiality. Meaning, truth, and values are dependent on the type and scope of query directed at complex systems, thus not derivable from first principles. This limitation however does not imply a collapse into relativism—a false dichotomy between Enlightenment standards of absolute certainty and relativism but is rather a limitation of the scope of any ideology or ethical framework. Standards for ethics that do not fall neatly into such dichotomies are instead needed.

Technologies are not only unpredictable as they interact as higher-level systems, but they change and undermine the fundamental conditions that they were intended to address, thus “destabiliz[ing] the world, changing cultures, worldviews, power relationships, and ethical, moral, and theological systems” (Allenby & Sarewitz, 2011, 71). Technologies destabilize ethical systems and lead to a lack of conceptual stability by transforming beyond recognition the basic conditions of human life, which in prior conceptions of technology, they were thought to ameliorate (Böhme, 2012, 8). The railroad, for instance—a “singularity” of sorts—led to such a radical transformation: “Things that people

had regarded, culturally and psychologically, as foundational—their sense of time, for example, or their sense of nature—were first rendered contingent, then swept away" (Allenby & Sarewitz, 2011, 71).

Technology thus transforms both human actions and the systems into which it is itself embedded, rather than efficiently furthering any particular ends. Instead, technology acts as a material *dispositif*—Foucault's term for "a conditioning factor that makes something else possible but also limits it, thereby giving shape to what it makes possible" (Böhme, 2012, 7). This undermines the idea of problem solving: technology does not solve problems, but rather transforms circumstances in unpredictable ways. The logic of problems and solutions is a Level I conceptualization. We instead have conditions, which are not solved but may be managed—at best.

7) Failure to overcome essentially modern thinking: modern ethics is experimental, rather than experiential (technology 7)

As noted above, embedded in modern ethics is an assumption that the nature of explanation for right action is theoretical, law-like, and algorithmic—seeking a minimum of formal rules, or a calculable method, that are contingent for their applicability on a simplified portrayal of reality. The epistemological standards of Galilean-Newtonian physics and the prescribed methodology of Descartes are thus evident in the foundations of modern ethics.

This is also reflected in the prominence of quandaries or "thorny issues" in theoretical ethics. Quandaries, in Borgmann's telling, are "the native soil of theoretical ethics" (Borgmann, 2007, 88). A quandary can also be thought of as a bounded singular case. Like an experiment in a lab, a quandary is thought to prove or disprove the veracity of an ethical theory—a single instance that reveals a contradiction in the theory shows up the limits of its consistency or application. Kant and Mill, when introducing and defending their respective theoretical frameworks, thus relied on common quandaries. It is accordingly the form of argument expected to demonstrate the truth of an ethical theory.

The experimental nature of modern ethics is revealed through its key metaphors. A quandary can be an instance derived from real life (though necessarily simplified) or a "set-up" case—a fictional account meant to work on our intuition and our reason in order to prove or disprove an ethical theory. The latter is commonly called a "thought experiment." One of the more common thought experiments in ethics is the infinite variations of the trolley problem, which involves the choice to pull a lever to kill or not kill various numbers of people on different tracks (or passively allowing it to happen in some instances, or perhaps pushing someone onto the track to save others). John Rawls's "veil of ignorance" is another prominent example of a self-described thought experiment, which he also refers to as a "device of representation" or a "selection device."[12]

Like the laboratory experiment, a thought experiment is removed from history, isolates variables, and asks us to perform this simplified, artificialized simulation (in our heads)—"a hypothetical or idealized process of rational deliberation" (Bagnoli, 2021). Other mechanistic metaphors used to describe the methodologies employed in modern ethics also reveal its Newtonian underpinnings[13]: most notably the "intuition pump"—a technical device much like Kant's imagined moral compass.

This failing will become clearer when I relate Heidegger's account of science and technology, much of which rests on the experimental/experiential fissure, which divides modern from pre-modern science. In pre-modern thought, wisdom is the ethical fruit of experience, whereas knowledge of the workings of nature is the epistemological fruit of experience. Each however depended on an acceptance of a natural law teleological account of the world, which modernity denies.

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[12] In *Justice as Fairness*, Rawls states: "the significance of the original position lies in the fact that it is a device of representation or, alternatively, a thought-experiment for the purpose of public- and self-clarification" (2001, 42). And again: "As such, the parties are artificial persons, merely inhabitants of our device of representation: they are characters who have a part in the play of our thought-experiment" (2001, 82). Finally: "The original position is a selection device" (2001, 107).

[13] I grant there is an important difference between Newtonian and modern ethical thought, namely that Newton's mechanistic cosmology may not leave room for human freedom and thus for ethics at all. However, I maintain that there is a strong commonality in the nature of explanation and basic form of thinking.

8) Failure to overcome critical-constructionist thought (technology 8)

Critical constructionism is an umbrella term for any of a variety of theories that are antirealist, and which reduce social and sometimes natural phenomena to power relations[14]. This general stance is critical of essentializing and unequal power relations, yet typically is silent about or celebratory of technological hybridization and remaking of nature.

Once again, like the critique of the abstract and detached nature of modern ethics, this is leveled at academia more broadly beyond ethics. Though critical-constructionism is not predominant in philosophical ethics, partly because constructionist accounts, as Borgmann points out, may not be helpful in making decisions since "only human whimsy and power remain" (2007, 21). Nevertheless, constructionism is prevalent in the social sciences and humanities, including in much of philosophy. Constructionist accounts motivate political action and thus have implicit normative commitments and ethical implications. Constructionism of sorts can even be found in certain interpretations of Kantian ethics—a "normative constructivism" (Bagnoli, 2021).

My focus however is primarily on constructionist accounts of nature writ large, ranging from William Cronon's famous critical analysis of wilderness to constructionist accounts of technology like Donna Harraway's cyborg and Latour's hybrid—each effectively in sway to "an ethic adapted to the demands of technology rather than a technology adapted to human nature" (or nonhuman nature) (Schmidt & Marratto, 2008, xiv).

Though this strain of thought would generally be considered postmodern, or in Latour's case, to, I think mistakenly, deny that we have ever been modern, a more appropriate interpretation would be that we are, in Albert Borgmann's vernacular, hypermodern: "intellectual postmodernism is tacitly hypermodernist" (1992, 53). This may be understood as "a devolved and quintessential modernity"

[14] I am tempted to call this a metaphysics of power.

(Heidegger's Philosophy), which "rather than seriously challenging modernity…simply follow[s] modernist assumptions to their logical conclusions" (Frodeman, 2003, 128).

In the fervor to upend categories of race, class, and gender, nature—seen as a witting accomplice—is run over roughshod, leaving the technological imperative unrestrained. Untrammeled wilderness must be challenged, yet untrammeled technology is somehow acceptable. In rejecting both essentializing and the concept of nature, post(hyper)modernism "is not able to provide us with any conception of degradation or degeneration" of human beings or non-human nature (Schmidt & Marratto, 2018, 126).

Alternatively, "Borgmann contrasts this hypermodernism with the idea of a postmodern realism that takes the category of nature (including human nature) seriously" (Frodeman, 2003, 128). In 1992, Borgmann coined the term metamodern to describe what he would later call postmodern realism—a postmodernism that recognizes and restrains technology (1992).

Contemporary constructionism, while differing in substantial ways, shares many of the same concerns and theoretical outlooks of contemporary derivations of Marxism. Each is "critical" insofar as they share a primary concern with exposing and reforming economic and power relations. Each is also, in different ways, a product of the Enlightenment—beyond simply a shared commitment to radical equality. Marxism for instance may be "the apotheosis of Enlightenment rationality" in its aspirations to rationally direct the economy—a wickedly complex system (Allenby & Sarewitz, 2011, 114). Constructionism meanwhile follows in the footsteps of Francis Bacon in its limitless vision of reforming and rationally reconstructing society and nature: "For the liberal imagination…the circumstances of human flourishing [can] be left entirely to radical innovation and rational design" (Borgmann, 2007, 74).

9) Failure to be useful in everyday decision making

Modern theoretical ethics, particularly the two major ethical theories—consequentialism and deontology—are primarily concerned with quandaries—limit cases—and as such each fails to provide substantive guidance in everyday decision making[15]. There are several reasons for this.

One of the important critiques given by philosopher Alasdair MacIntyre to support his claim that Enlightenment ethics has failed is that there are no accepted legitimate means of resolution between the various modern ethical theories[16]. Not only are there no rational means to decide between these theories (despite claims to the contrary by proponents of each), but neither is without internal contradictions, both in doctrine and in ethical guidance. John Stuart Mill himself pointed out that "[t]here exists no moral system under which there do not arise unequivocal cases of conflicting obligation" (Mill, 1957, 32). A similar sentiment is echoed by philosopher Martha Nussbaum: "Our moral duties are not always simple, and may…impose conflicting demands on the well-intentioned person" (Nussbaum, 1997, 25). Such cases arise in the real complexities of everyday decision making.

Furthermore, in real, everyday cases, ethical theories do not work since "reality overwhelms principles with complexity" (Borgmann, 2007, 82). There are countless, contradictory, and unforeseen obligations that arise in any real ethical situation. And in the obvious cases in which they work, theory is not needed:

> We know in dire circumstances without the help of theory what is right even if we can't get ourselves to do it. An ethical theory is put to its real test when it is applied as a comprehensive view to the subtle and complex issues of today's typical human condition (Borgmann, 2007, 57).

[15] Virtue ethics—at least as a formal system in its contemporary incarnations—may also fail to be useful in everyday decision making, but its theorists do not generally aspire to such, nor do virtue ethicists share the same fixation on moral quandaries.

[16] MacIntyre writes: "When claims invoking rights are matched against claims appealing to utility or when either or both are matched against claims based on some traditional concept of justice, it is not surprising that there is no rational way of deciding which type of claim is to be given priority or how one is to be weighed against another" (2007).

This practical failure is true not only of the inability of modern ethical theory to deal with everyday complexity, but the process of trying to reason—or more accurately calculate—one's right course of action when it really matters, is probably impossible and usually unnecessary. As noted by others, saving a child in danger does not need calculation, and even if it did, "the application of Kant's or Mill's theories to an urgent moral problem is unrealistically lengthy and cumbersome" (Borgmann, 2007, 74). Finally, this shortcoming of theoretical ethics is not only true of the everyday decision making of individuals, but also applies to policy and institutional decision making[17].

10) Failure to substantively engage with empirical considerations of ethical decision making

Modern ethics, whether Kantian "idealized insistence on the rationality of the moral agent" or utilitarianism's "equally unempirical postulation of the commensurability of all satisfactions" (Laidlaw, 2014, 90), is in fact idealized and unempirical, and thus simultaneously misses both the actualities of human decision making and the actual disposition of the human being, who—empirically—we might be hard pressed to call *rational* (and vice-versa, it is within the realm of empirical possibility that non-human animals could be uniquely ethical). Though Kant, Mill, and other modern ethical theorists rely on cases to further their theoretical positions, they lack any real depth, and ultimately theoretical commitments trump empirical evidence.

Moral philosophers might here insist that reason is sufficient unto itself to provide universal moral principles and that lived ethical practices and everyday decision making is a flawed and pointless

[17] MacIntyre addresses this as well: "rights theorists, utilitarians, universalizability theorists, contractarians and multifarious protagonists of various blends of these each advance their mutually incompatible solutions to the problems of each particular profession, yet of course with a notably different outcome from that within moral philosophy itself. For in the realm of professional practice matters which affect problems of immediate action cannot be allowed to go unsettled. One way or another codes must be formulated, choices made, dilemmas resolved, with or without rational justification. Hence in this dilemma what is in fact inconclusive intellectual debate nonetheless issues in the practical resolution of problems, a resolution the arbitrariness of which it is the function of both philosophical and professional rhetoric to conceal" (quoted in Schmidt & Marratto, 2008, 167).

starting point: an *ought* cannot be derived from an *is*; and to start with actuality can only end in relativism. However, as previously noted, the schism between relativism and absolutism is a false dichotomy born of Enlightenment commitments to absolute certainty and knowability; and the schism between *is and ought* is challenged by explanatory accounts like evolutionary psychology.

What are often thought of as flaws—our piecemeal, awkward approach to actual decision making—"to be escaped by means of the intellectual tools of the Enlightenment"—is actually a viable starting point for an ethics sufficient for reality—a "reframing of what we do anyway, making a virtue out of reality, and thus opening up the possibility of doing it more consciously" (Allenby & Sarewitz, 2011, 172).

Ethics needs the empirical not only to properly understand the true character of morality, but as a window onto the world that responds to the actual makeup of reality in its diversity and complexity. Riffing from Kant's famous formulation, "Concepts without intuitions are empty, intuitions without concepts are blind," Borgmann writes,

> social science without ethics is aimless; ethics without social science is hollow. In fact, the two fields inevitably overlap. There is no social science research that is not tethered, however indirectly, to concerns of social justice and human flourishing, and there are no ethical reflections that fail to appeal somehow to the actual human condition (2007, 15).

And moving beyond social justice and human flourishing, this is true of environmental ethics as well.

Greater empirical engagement with lived ethical decision making via disciplines such as the anthropology of ethics and field philosophy, as well as the world's texture and complexity, is thus integral. This is a component of wild ethics, which I will return to in the final chapter.

Into the Wild: Moving Beyond Modern Theoretical Ethics

As noted above, theoretical, or normative ethics, though dominant in academic philosophy, is only one of several types of ethics. Applied ethics, and to a lesser degree, practical ethics, is also quite commonly accepted. Applied ethics moves from theoretical ethics to real-world situations, while practical ethics usually engages with theory, but starts with actual problems. Environmental ethics and professional ethics typically sit somewhere between applied and practical ethics.

Albert Borgmann introduces an additional type of ethics: real ethics. Real ethics focuses on the everyday material realities that constrain ethical behavior, more broadly construed to include the good life and excellence:

> Real means tangible; real ethics is taking responsibility for the tangible setting of life. Real also means relevant, and real ethics is grounding theoretical and practical ethics in contemporary culture and making them thrive again (2007, 11).

It does this by "investigat[ing] the moral structure of the material culture" (2007, 30) "that engages and surrounds us" (2007, 29).

Real ethics is needed as an additional genre to fill in for the shortcomings of practical and applied ethics, for even if applied ethics solved all the social, environmental, and political issues it focuses on, we would still be lacking the fullness and excellence of the good life. Applied and practical ethics attend to "the texture and the richness of ethical conduct but, if it goes no further, remains inconsequential and inconclusive as regards the quality of our lives" (Borgmann, 2007, 30). This capacity for excellence necessitates attentiveness to the material environments that shape us—in short, a responsiveness to Churchill's Principle.

In Borgmann's analysis, each type of ethics is complementary, much like the components of the body: theoretical ethics functions like the skeleton, practical ethics the tissue, while real ethics "sets the organism in its environment and allows us to see whether the organism is prospering or not" (2007, 30).

Theoretical ethics thus provides necessary landmarks but cannot offer actual guidance in everyday decision making nor create the proper conditions for the good life.

I accept Borgmann's assessment that the range of ethical approaches from theoretical to practical is insufficient: real ethics is in fact a necessity. I however depart from Borgmann in two respects. First, I am more skeptical of the efficacy of modern theoretical ethics. These approaches are flawed not only in their commitments to key Enlightenment ideals, but have been significantly undermined by technology and technical thinking.

Secondly, real ethics is insufficient for environmental concerns. Borgmann, while praising the aims and outcomes of environmentalism, is critical of its foundations. The motivations and discourse underpinning environmentalism, like those of social justice, are narrow and unclear due to a lack of vision of the good life. Environmentalism focuses primarily on threats and thus misses its important core—the moral force of nature in the context of, and in contrast with, technology (2007, 20).

Thus, while Borgmann maintains that wilderness and nature are important as a moral force in our lives, in a manner akin to the culture of the table, his overwhelming concern is with social and individual human flourishing. Real ethics is thus too anthropocentric and too far removed from the core concerns of environmental ethics—particularly in its conservation-oriented facets—to lend itself to a robust environmental ethic that leaves room for the wild.

Academic environmental ethics, meanwhile, is typically some variant of applied theoretical ethics, often focusing on questions of rights or intrinsic value in nature, though lately environmental justice has come to subsume other concerns. Academic environmental ethics is thus insufficient. Like modern theoretical ethics, of which it is scarcely a step removed, it falls prey to many of the same criticisms of theoretical ethics I have outlined in this chapter.

Real ethics, in its focus on the material circumstances of our world, provides a solid starting point for an ethics appropriate for the wild. There is however a need for a fourth type of ethics: one that

is an outgrowth, rather than an afterthought, of direct engagement with the intricate complexity of wild places—a wild ethic.

I will develop and defend the need for wild ethics in the final chapter, but first I will consider the complex relationship of science, technology, and environmental values by attending more deeply to the essence of modernity as it manifests both theoretically and in concrete practices and situations, which I will detail with case studies focused on wildlands management and the human relationship with the global cryosphere.

Chapter Two: Case Studies - Wildlands and Ice

In this chapter, I give sketches of two case studies: the first is the management of wildlife and wildlands in which I will focus mainly on designated wilderness areas in the United States—some of the few places on earth uniquely and specifically meant to remain wild; for the second, I will shift scales dramatically to the earth's cryosphere—the sum of the earth's snow and ice. My focus however will be on large bodies of ice, particularly glacial and sea ice, which are overwhelmingly concentrated at the poles, and secondarily in the highest mountains, especially the Himalayas and southern Andes. The icy regions of the earth are some of its most inhospitable, least populated places, yet they are globally significant, particularly for the role they play in climate change, and for the global implications this loss of ice will entail.

Each case examines nature at drastically different scales—from locally significant protected places to globally distributed earth features—though they also overlap in substantial ways. Each are proxies of the human relationship with nature writ large, and each are aspects of nature with significant symbolic power: in literature, indigenous cultures, and science. Another common theme that will emerge in these case studies is the profound implications of a lingering Cold War mentality, which epitomizes a technical approach to nature. The Greenland ice sheet was home to Camp Century—a U.S. Army base designed and constructed by the U.S. Army Corps of Engineers—built beneath the surface of the ice sheet to evade detection by the Soviet Union. In the wildlands case, wildlife biologists working in Yellowstone National Park revolutionized wildlife biology and wildlife management through the application of Cold War surveillance technology.

I intend to show that despite some proclamations of a "post-wild world" (Marris, 2011) due to the variety of ubiquitous anthropogenic onslaughts from climate change, invasive species, various forms of pollution, and increasingly powerful technologies, we will never be post-wild, nor can we ever go back to a primal fully wild world, which probably has not really existed for at least 10,000 years. We will never

fully have one or the other, but instead we need to design for the wild by radically revising our sense of design. I will return more specifically to management and design in chapters 5 and 6.

Wild ethics, as I envision it, begins with the actualities of wild things and places and as such offers vital perspectives regarding how we should act towards and manage these aspects of our world. With these cases, I will begin to show the philosophical importance of an unprecedented and necessary shift to design and management, while highlighting the technological threats this presents, not only to wildness, which will be my primary focus, but to democracy. How wild places and things are known and presented has direct implications for how they are managed—shaping both their present identity and the possibilities for their future evolutionary course.

Wildlands and Wildlife Management

My focus for this case study is exclusively on the United States, especially designated wilderness, though non-wilderness parks, forests, and other wildlands are included as many wildlands that are not specifically designated as wilderness are deliberately managed as such or are otherwise similarly wild in character. This analysis should also have broader implications beyond the United States. Wilderness areas are any U.S. federal lands that are formally designated as such under the 1964 Wilderness Act, which begins:

> In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness (Wilderness Act, 1964).

It thus establishes a National Wilderness Preservation System out of pre-existing federal lands. The Wilderness Act goes on to state that in addition to providing for visitor use and enjoyment, "wilderness character" must be preserved. Wilderness character is not explicitly defined in the

Wilderness Act, creating the necessity to interpret its meaning based on the statutory language of the Act:

> Wilderness character is a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature. Taken together, these tangible and intangible values define wilderness character and distinguish wilderness from all other lands (Landres et. al, 2015, 2).

Two things stand out most in this description:

*First, the contrast of wilderness with *modern* (manipulation and impact). I will return to this when I thoroughly consider modernity in the following chapter.

*Second, the distinction between tangible and intangible values, each of which is meant to somehow reside in the interaction between humans and wilderness.

The tangible values of wilderness are summarized in five qualities of wilderness character, derived from the Act itself and supported by relevant legal interpretation and foundational writings on wilderness by the Act's author, Howard Zahniser and others. These are:

1) Untrammeled, which is to be "essentially unhindered and free from the intentional actions of modern human control or manipulation" (Landres et. al., 2015, 10)
2) Natural, which means that "wilderness ecological systems are substantially free from the effects of modern civilization" (Landres et. al., 2015, 10)
3) Undeveloped, which means to lack modern structures, installations, or the use of mechanized equipment
4) Solitude or primitive and unconfined recreation
5) "Ecological, geological, or other features of scientific, educational, scenic, or historical value"

Intangible values include “historical and current cultural connections to the landscape”; “symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature”; or “spiritual values, traditional practices, and traditional and historical stories” (Landres et. al., 2015, 2).

Of all these values or qualities, untrammeled is perhaps the most important, the most difficult to preserve, and the least understood (and is thus often unfairly maligned). Untrammeled is often confused with untrampled, which to many implies “pristine” or “untouched”—at least in the way that critical social scientists have vilified the terms. In actuality, untrammeled means unrestricted or unconfined. A trammel is a restraint or hobble. Thus, “Wilderness is an area where the earth and its community of life are untrammeled by man, in which an area retains its primeval character and influence.” Wilderness areas should be allowed to run “free and unhindered from the *intentional actions of modern human control or manipulation*” (Landres et. al, 2015, 10-11; emphasis added). Untrammeled differs from wildness in that wildness is a condition that does not require a relationship of deliberate self-restraint as does untrammeled. When we do give a place “freedom from our willfulness,” we leave room for the untrammeled wild (Kaye, 2018).

Each of the qualities of wilderness character are equally important, but untrammeled has been interpreted to be “first among equals” and thus trumps the other qualities in a tie in which a management decision might have equal benefit or detriment to wilderness character. This is so because “the statutory definition of wilderness describes ‘untrammeled’ in a separate sentence; the importance of untrammeled as the essence of wilderness has a long history in the wilderness literature; and no other land designations are by law to be kept untrammeled” (Landres et. al., 2015, 27). Zahniser for instance wrote that “…the first sentence [on untrammeled] is definitive of the meaning of the concept of wilderness, its essence, its essential nature…The first sentence defines the character of wilderness” (Zahniser, 1963, 68).

Of note is that, legally speaking, the requirement to preserve the untrammeled quality of wilderness, as a part of wilderness character alongside the other four qualities, only applies to actions undertaken since the passage of the Wilderness Act, thus excluding prior intentional manipulations such as the historic use of fire by indigenous peoples. Nor does it include unintentional management actions or unintentional, pervasive outside forces like climate change: "Actions for which there is no opportunity for managerial or individual restraint are not considered a trammeling" (Landres at. al., 2015, 103). Additionally, a significant way that untrammeled differs from natural is that the former is concerned with actions, while the latter focuses on effects (Landres et. al., 2015, 34). In other words, untrammeled uniquely focuses on the *how* of management, rather than the content of *what* is present.

Untrammeled is thus the most distinctive aspect of wilderness, not only distinguishing it from other federal lands, and not only from lands in general, but more profoundly from the planet's emergent epoch. Untrammeled has been defined as "an absence of rationally planned human intervention" (Ridder, 2007), which obliges a withholding of our power over nature—necessarily grounded in humility and restraint. Rational planning and intentional, modern human manipulation are increasingly pervasive, in step with the growing power and ubiquity of technology, and the necessary shift from inadvertent, collective detrimental impacts to deliberate design. Untrammeled offers an alternative. I will develop these insights in the next chapters specifically focused on science, technology, and modernity, before returning to management and design.

Managers of wilderness are required by law to preserve wilderness character. To do this, they must account for the tangible and intangible values of which it is comprised. Effective wilderness stewardship is thus accomplished through monitoring. Monitoring is systematic, scientific measurement over time in order to assess whether management actions are accomplishing their intended objectives. Monitoring must thus be data driven and practically operationalized. Measures are thus selected to represent each of the tangible qualities: untrammeled, natural, undeveloped, etc. For instance, the

number of suppressed naturally ignited fires can serve as a measure for the untrammeled quality. Tangible qualities are thus technically rendered through scientific measurement. A monitoring strategy is needed that avoids selecting indirect "proxy" measures, yet quantitative data must necessarily always be a proxy for a quality.

This shortcoming is present in any form of monitoring as "a single integrative metric based on disparate pieces of information" can lead to unintended consequences and abuse (Landres et. al., 2015, 24). One author has noted that for ecological integrity, this approach is "arbitrary at best and dangerously deceptive at worst" (Andreasen, 2001, 29). Quantitative monitoring is nevertheless generally interpreted as practically and legally necessary. It is however not complete. Selecting measures should be informed by professional judgement and a more holistic sense of wilderness. This holistic sense, encapsulating intangible values, is best captured by narrative:

> The wilderness character narrative is a qualitative, affirming, and holistic description…The narrative is [potentially useful] in complementing and enhancing wilderness character monitoring…This monitoring strategy reduces wilderness character to specific measures and data, and the narrative is a tool to help…recognize the broader and holistic meanings of wilderness character for an area…The narrative is intended to capture the feelings and relationships of a wilderness...[and] acknowledge, celebrate, honor, and respect the intangible, experiential, and inspirational aspects of a wilderness (Landres et. al., 2015, 83)[18].

At its best, the narrative does more than "complement and enhance" scientific monitoring however: it serves as the poetic foundation of technical monitoring. In later chapters, I will show the importance of this helix of the technical and poetic, including the remarkable similarity of this wilderness management strategy to other contexts.

[18] Retired ecologist Peter Landres was one of the primary architects of the incorporation of narrative into wilderness management. In an interview, he described the wilderness character narrative as a "holistic, site-specific, evocative document," which describes "why people love this place, what is special about it," and it is thus "an avenue into how we need to be thinking about wilderness—not from a science perspective, but from an emotional values-based perspective." Peter sees the role of the wilderness character narrative "as a touchstone to make sure we haven't lost sight of the big picture, to make sure we're doing the right thing" wherein "if you have a really difficult decision to make, go back and read the narrative" and evaluate your decision based on whether it will enhance or diminish the vision articulated in the narrative. More ambitiously and hopefully, Peter identified the narrative as incorporating a "grounding that western civilization has ignored," which might—if applied in other contexts beyond wilderness—"start changing the entire relationship that people have with the land."

Buried just underneath what might otherwise be dismissed as mundane discussions of monitoring and managing wilderness are deep genealogies of thought by philosophers and conservationists. Distinctions made between the tangible and intangible, qualitative and quantitative, modern and nonmodern have deep roots with historical significance.

One historical manifestation, reflecting some of these divisions, is the well-known ideological divide between Gifford Pinchot and John Muir, usually characterized as a debate between conservation and preservation. Pinchot furthered a model of sustainable, "wise" resource use, which meshed well with commercial enterprise, while Muir sought the protection of lands without human harvest or intervention, preserved for their superb beauty and the profound experiences they allow. This split is still reflected in the fundamental compositions of the differing land management agencies that Muir and Pinchot birthed. The National Park Service focuses primarily on preservation and the U.S. Forest Service (USFS) is primarily concerned with the sustainable harvest of forest products, though the U.S.F.S. has developed from its origins and is now one of the four agencies that manages wilderness, along with the National Park Service (NPS), Bureau of Land Management (BLM), and the Fish and Wildlife Service.

A Tale of Brothers

Less well known than the rivalry between Pinchot and Muir, but likely just as significant, with effects that are perhaps more pervasive in everyday management settings, is that between John and Frank Craighead—celebrity bear biologists at Yellowstone National Park in the 1960s, and Adolph Murie—a pioneering wildlife biologist most famous for his study of wolves in Denali National Park—over the role of science, technology, and human intervention in wildlands[19].

[19] For the narrative details of this case, I rely primarily on Jordan Fisher Smith's *Engineering Eden* focused on bear management in and around Yellowstone National Park during the 1960s.

Yellowstone—the first U.S. National Park—was the site of a clash over the roles of science, technology, and intervention in management (Smith, 2016). Up until the 1960s, Yellowstone Park infamously included open dumpsters and deliberate bear feeding. Despite the 1916 Organic Act's mandate to not only provide for the enjoyment of future generations, but also to conserve National Park wildlife and "natural objects" unimpaired (Organic Act, 1916), mid-century Park Service management was often defined by "recklessly unscientific interventions" (Smith, 2016) and motivated strongly by a tourist-centered, commodified approach (Duncan, 2009).

Former NPS biologist David Graber characterizes this as "cowboy biology": "before the Leopold Report, I called it cowboy biology. We made it up as we went along. If Yellowstone wanted more buffalo, they got it" (Smith, 2008). Scientific research did take place, but usually it did not meaningfully inform management decisions. During this period, Yosemite was similarly guided (Duncan, 2009). In addition to the infamous nightly Yosemite Firefall spectacle, instances of ecological interventions—well described as cowboy biology—as documented by NPS biologist George Melendez Wright, included spreading oil over portions of Yosemite Valley for mosquito control, the distribution of poisoned grain to regulate ground squirrels, and the proliferation of vegetation-stripping deer due to the absence of most natural predators due to extermination (Smith, 2016, 58).

Throughout the first half of the 20th century, however, the sciences of ecology, conservation biology, and wildlife biology were rapidly developing. These developments, alongside a resurgence of environmental concern, would push cowboy biology aside. In Yellowstone, the Craigheads would utilize technology to develop new approaches, which would revolutionize wildlife biology and eventually the other sciences relevant for conservation.

As these sciences developed, so did competing views on how nature ought to be managed. Growing out of Aldo Leopold's more unified view, Adolph and his equally renowned biologist brother Olaus Murie—developed a non-interventionist stance that would come to inform wilderness ideals,

while George Melendez Wright—a biologist and the first chief scientist of the National Park Service—believed in the appropriateness of selective intervention backed by science. The latter approach however now relies heavily on the kind of technological science the Craigheads would later develop.

It is important to note that it was primarily scientists—professionals dedicated to the study and management of wildlands and wildlife—that developed these competing views. Neither can thus be said to be more scientific than the other but are instead guided by differing sets of values. Nor are these values reducible to arbitrary personal preference. Dividing the interventionist position from the non-interventionist is more than ideology: it rests on the way science is conducted and a history of thought stemming from practical engagements with nature. I will thus focus on this history in the following chapters.

The Muries followed in an older naturalist tradition, which necessitated long periods of time in the field paddling boats, driving dog teams, or simply walking—engaged in "shoe leather" study—embodied ventures directly and carefully observing the natural world with the naked senses, with minimal interference, and while gaining intimate knowledge of individual animals, families, and places. In one season, Adolph Murie hiked about 1,700 miles as part of his study of wolves in Denali—studies which eventually led to the termination of the Denali wolf control program (Franklin, 2004). This kind of study however had its limitations, particularly in scale: it was limited in space—unable to capture the full ranges of wildlife; limited in time—only what was witnessed firsthand when a scientist was immediately present could be recorded; and limited in scope—population ecology was far less feasible (Craighead et. al., 1995).

The technologies developed by the Craigheads would fundamentally change this. They would apply Cold War "deep surveillance" systems developed by military contractors to spy on the enemies of

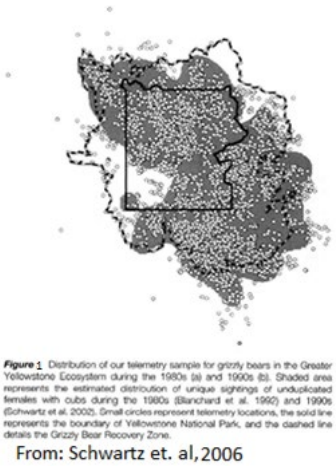

Figure 1 Distribution of our telemetry sample for grizzly bears in the Greater Yellowstone Ecosystem during the 1980s (a) and 1990s (b). Shaded area represents the estimated distribution of unique sightings of unduplicated females with cubs during the 1980s (Blanchard et al. 1992) and 1990s (Schwartz et al. 2002). Small circles represent telemetry locations, the solid line represents the boundary of Yellowstone National Park, and the dashed line details the Grizzly Bear Recovery Zone.

From: Schwartz et. al, 2006

Figure 1: Craigheads' telemetry map of Greater Yellowstone Ecosystem

the United States to the study of grizzly bears and other wildlife. This shattered the limitations of the naturalist's shoe leather study. Omniscient 24/7 surveillance of wildlife was now possible, revealing their entire ranges, and the population-level dynamics into which individual animals were embedded—each of these over long-time scales (Smith, 2016, 41). These methods, by showing the migration patterns of Yellowstone wildlife, ultimately revealed the interconnected and expansive dimensions of the Greater Yellowstone Ecosystem—composed of two national parks, five national forests, two national wildlife refuges, and interspersed private lands—altering the very meaning of the park boundary (Middleton et. al., 2019).

The Craigheads, in cooperation with a Silicon Valley defense contractor, would develop the first radio collar in 1961, which made wildlife telemetry possible. The use of aircraft, aerial photography, radio and satellite tracking, as well as capturing, darting, and measuring immobilized animals, would either be pioneered, or solidified as accepted practiced, by the Craigheads, often made possible by grants from the Atomic Energy Commission and NASA (Smith, 2016, 48; Radio Tracking, 1965). And as these technologies were being developed, other management methods, like herbicide use to control invasive species, were becoming established practices. Amidst these developments, a new topic emerged: can technological means be justified to achieve natural ends?

There is a bit of irony here: technologies developed to spy on people were adapted to the study of nature, reversing and challenging what has been called by one philosopher of technology, "the central insight of modernity theory: the extension of technical control from nature to humans themselves" (Feenberg, 2010, 144). Yet of course, the application of these technologies to humans would also progress in step: ubiquitous surveillance is now applied globally to domestic citizens and

foreigners by both private corporations and state entities—the U.S. National Security Administration's PRISM and China's mass surveillance most infamously (Baumann, et. al., 2014).

The Muries resisted these developments, however, calling out the Craigheads' "gadgetry," their visible markings on wildlife, and general interference with, and disturbance of, wildlife (Wondrak, 2006). Olaus for his part "had long believed that the machine was ruling our civilization, that science and society had become victims of the technologists" (Murie, 1960b). Adolph Murie and Howard Zahniser also reacted against the 1963 Leopold Report[20]: *Wildlife Management in the National Parks*, written by Aldo Leopold's son, Starker. Among the many guidelines provided for wildlife management in national parks, Starker wrote that "*A reasonable illusion* of primitive America could be recreated, using the utmost in skill, judgment, and ecologic sensitivity," while in certain instances, original conditions should be "*simulated*", particularly in the viewsheds of park roads observable by the general public (Leopold, A.S., 1963)—resulting in a thin veneer of forest masking clear cuts—a "beauty strip." Adolph noted however that this was "contrary to generally accepted wilderness philosophy" (Smith, 2016, 130).

The question of aesthetics thus looms large. Beauty has long been integral to conservation thought. Aldo Leopold famously referred specifically to beauty in his formulation of the land ethic: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, A., 1949, 211). However, there are crucial differences between the veneer of beauty that Starker seemed to propose and Aldo's more substantive conception in the land ethic. This variance is reflected by the Muries' simultaneous objections to both Starker's proposal and the visual impact of the Craigheads' research. Questions thus emerge at the intersection of science and aesthetics: for instance, to what degree were management actions by Yellowstone N.P., like

[20] As well as the NPS Mission 66 initiative in Denali, which would have paved and widened the park road among other developments. He was also the inspiration for Denali's first backcountry management plan: "The writers of the park's first backcountry management plan used Muries' wilderness ethic as their guide - it was visionary" (Franklin, 2004, 104).

elk culling, or spraying herbicides to eliminate spruce budworm and pine beetle "arbitrary aesthetic judgement[s]" or scientific necessities? Or is this a false dichotomy? (Smith, 2016, 162).

During a court case ruling centered on Yellowstone's role in a fatal bear mauling, the judge—a former Naval technician—questioned removing collars and ear markings from bears to "beautify" them for the Park Centennial. He ruled instead that signs informing visitors of hazardous wildlife activity and monitoring employing the techniques developed by the Craigheads were now required by the Park Service (Smith, 2016, 281; Martin v. United States).

Knowing Nature

Underlying this conflict over the uses and roles of science, technology, and intervention in wildlife management is a history of thought stretching back at least as far as the Enlightenment, which has important implications for technocratic management. Just as the Enlightenment has deeply informed modern ethics, it has shaped visions of what nature is and how it can be known. On the one hand, following modern Enlightenment aspirations, is the development and application of Cold War technologies to knowing and managing nature; on the other, a naturalist tradition, resulting, in this case, in a non-interventionist position.

Jordan Fisher Smith in his account of the Yellowstone case provides this reflection on the Muries' positions: "There was something distinctly backward-looking about the old North American naturalist tradition, which was aligned with Romanticism in its suspicion toward the modern and the civilized" (Smith, 2016, 49). There is an important insight here. Romanticism emerged as a response to the Enlightenment and has also cast its influence over conservation thought. Though often disparaged in

typical discourse—taking a corrective form like "don't romanticize…[21]"—the legacy of romantic thought is still relevant, if often misunderstood.

A genealogical perspective, in the tradition of Nietzsche and Foucault, into the historical development of these conflicting lineages of thought provides useful insights. I will show in the following chapters these underlying genealogies that made possible the wildlife biology of the Craigheads, which derives directly from modernist Cold War era surveillance technology, and the Muries' wilderness ethic, which follows in the poetic lineage of H.D. Thoreau, Goethe, Alexander von Humboldt, and later Aldo Leopold, with important parallels to many indigenous traditions. For now, I offer the following.

The Yellowstone case reveals the outlines of four ways of knowing nature, each with direct implications for environmental management. Some of these, particularly technics and poetics, I will substantially develop in later chapters:

1) "Cowboy biology": scientifically uninformed and commodified based on a tourist-centered vision, exemplified by National Park Service management in Yellowstone and Yosemite prior to the 1970s. This might be considered a "shallow aesthetics."
2) Technical: a modernist vision of nature known, surveilled, and managed by modern science and technology, exemplified in this case by the Craigheads' application of Cold War technology to Yellowstone area grizzly bears and other wildlife.
3) Poetic: nature known by embodied, sensual encounter, exemplified in this case by the Muries' naturalist science and associated vision of wilderness without deliberate human interference. This might be considered a "deep aesthetics."

[21] e.g. "Romanticizing and reifying the 'othered'" (Boelens, et. al., 2019), "nor is there either romanticism or sentimentality" (Berkes, 2018, 128); "to reduce it to anything that's romantic or rose-colored glasses" (Rubin & York, 2018), OR "Heidegger is not a 'primitive' or a 'romantic.' He is not one who seeks escape from the burdens and responsibilities of contemporary life into serenity, either through the re-creating of some idyllic past or through the exalting of some simple experience" (Lovitt, W. in Heidegger, 1977).

4) Traditional ecological knowledge (TEK): ways of knowing nature held by Indigenous and other peoples with similar, long-standing relationships to places. In the Yellowstone case, TEK was largely lost due to conquest, disease, and genocide.

Each of these ways of knowing nature should not be thought of as wholly mutually exclusive, but the distinctions are meaningful. Each also creates or implies environmental values that are the foundation of differing forms of managing nature.

Figure 2: John and Frank Craighead, Source: Craigheadresearch.org

Figure 3: Olaus and Adolph Murie, Source: Inforum.com

Figure 4: "Lunch Counter - For Bears Only" at Old Faithful, southeast of the upper Hamilton Store. Source: Yellowstone National Park.

The Craigheads did not work for the National Park Service and were thus in one sense bureaucratic outsiders. However, in their approach to nature, and in their cozy ties to the U.S. military and defense contractors, they exemplified a technocratic stance. Recent American history is replete with similar conflicts between charismatic bureaucrats—representing the technical aspect, and literary activists—representing the poetic, sometimes manifesting this opposition even more starkly than that between the Craigheads and Muries.

1) Gifford Pinchot of the U.S. Forest Service and John Muir of the Sierra Club conflicted over the management of wildlands and the creation of the Hetch-Hetchy Dam in Yosemite National Park. Muir's poetic vision of nature contrasted with Pinchot's utilitarian scientific management.
2) Floyd Dominy of the U.S. Bureau of Reclamation and David Brower of the Sierra Club conflicted over dams throughout the western U.S., captured well in John McPhee's *Encounters with the Archdruid*. Brower situated undeveloped places into a humbling vision of human insignificance in the span of geological time, while appealing to Muir's metaphors of nature as cathedral, in contrast to Dominy's self-description: "I was a crusader for the development of water. I was the messiah" (Arnold, E., 2010).
3) Earl Butz, the U.S. secretary of agriculture under Nixon and Ford, and Wendell Berry—author and farmer–conflicted over farming practices, specifically industrial agriculture and small-scale family farming. Butz's sentiment, "get big or get out," has had marked effects on American farming and waistlines (Sorensen, 2019).

Each technocrat above, whose grandiose goals may have been a series of mega-dams across the entire Colorado River watershed, or monitoring Yellowstone grizzlies with enemy surveillance technology, or maximizing agricultural productivity and profitability at the expense of small farmers and

cultural continuity, exemplifies a modernist vision of nature and society. Yet underlying their commitments to a clean, efficient, rational vision of the world, they are motivated by an inexplicably irrational drive. Like policy makers for the Interstate Highway System, they "did not merely think of [their technological goals] as a good idea and a fine thing if they could have it. They were visionaries and zealots on behalf of a sacred cause" (Borgmann, 2006, 178).

Wendell Berry, reflecting on the limitations of these technical visions, whose aftermath included the demise of the small farmer in the U.S., notes that there is a contrasting "attitude"—one that "does not come from technique or technology":

> It does not come from education; in more than two decades in universities I have rarely seen it. It does not come even from principle. It comes from a passion that is culturally prepared—a passion for excellence and order that is characteristically and may be exclusively handed down to young people by older people whom they respect and love. When we destroy the possibility of that succession we will have gone far toward destroying ourselves (Berry, 1974).

An "attitude" rather than a technique, "a passion that is culturally prepared" rather than a principle, a "succession" within a tradition rather than ahistorical rationality—each offer glimpses into wild ethics and the relationship of knowing nature and acting rightly towards it.

I have thus far employed the case study of wildlands management to demonstrate the deep connection between knowing and managing and the human relationship and treatment of wild nature. I now shift scales to the global cryosphere to show how this same pattern is present and thus applicable in wider contexts.

Melting Ice and Planetary Systems Management

The earth's ice is melting. Sea ice is diminishing while ancient ice caps and glaciers pour themselves into the oceans. To most of us, the earth's icy landscapes seem remote. Yet, the furthest reaches of the earth are responding directly to us, to our daily decisions. Our fates are tightly bound together: as we shape the future of ice, ice shapes our future.

The loss of this reflective white coating will accelerate warming as more solar energy is absorbed by the dark surfaces of land and water. Ocean currents will transform. Millions of people who depend on glacial meltwater will suffer. Highly populated coastlines and island nation-states will disappear under rising seas. Millions of refugees will be displaced. Conflicts will intensify. This is not inevitable, but it is the course we are on.

Ice is also extraordinarily beautiful, powerful, and diverse. Like a species, ice manifests in a multiplicity of forms in response to the vicissitudes of individual places; it is locked in finely-tuned webs of interdependence; its active and evolving presence is valuable in its own way. Unlike a species, its loss will not be total, but it will be substantial. In many places, an ancient lineage of deposition, expansion, and intimate co-creative mutuality will cease to be. Naked rock and motionless moraine will stand in stifled testimony to the colossal glory that once was. We are losing one of the most significant active geological forces on the planet and robbing the earth of one of its most wondrous phenomena.

This, at least, is one way of thinking of ice. Here is another: "Glaciers are our water reserves, and, for many communities, they act as naturally created water towers, rationally regulating water flow into local environments" (Taillant, 2015, 46). This is a common rendering—one that appears even in high-level international climate negotiations. In the 2019 IPCC Cryosphere and Oceans Report (Special Report), one of the articles cited is *Changes in Central Asia's Water Tower: Past, Present and Future* (Chen, 2016). Discussions of melting Himalayan glaciers often use the phrase "watertowers of Asia,"

though the term “watertower” is often applied to glaciers and other forms of high mountain snowpack and ice throughout the world.

Another common depiction is “reservoir”; for instance, “vast inland reservoirs of ice” (Wylie, J. 2009, 35) or “glaciers are virtually frozen reservoirs of fresh water” (Kluczyński, 2014, 20). In some mountain ranges, like the Himalayas, as glaciers are receding, the damned remnants of flowing rivers—reservoirs—are appearing (or are planned to appear) in step (Bandyopadhyay, 2002). In one sense then, glaciers—already thought of as reservoirs or watertowers—“rationally regulating water flow”—are being replaced by literal reservoirs. The equivocating language of resource culminates here in a managed resource. In this rendering, rivers and glaciers are equivalent parts in a technical system for delivering water to lowland populations—for drinking, agriculture, and power generation. There is thus no substantive loss when glaciers melt, and rivers disappear under artificial lakes except perhaps the inconvenience of dam construction.

Or, in a more fully technocratic vision of ice, following WWII visions of “bergships”—aircraft carriers made of ice—the Greenland ice sheet would become the pilot site of a subsurface nuclear-powered military base—a “city under ice.” Camp Century was planned to be the proving site for Project Iceworm—an ambitious series of tunnels and bases excavated into Greenland’s ice sheet, where mid-range ballistic missiles carrying nuclear warheads could be positioned and clandestinely moved beyond the detection of the Soviet Union (Hvenegård-Lassen, 2016).

The Army Corps of Engineers described Camp Century as “located in a wilderness of ice and snow” providing “modern” amenities and living: “in this remote setting, less than 800 miles from the North Pole, Camp Century is a symbol of man's unceasing struggle to conquer his environment,” and in a Baconian equivocation of knowledge and power, this struggle to conquer is equated with “man's never-ceasing quest for knowledge” (*The Big Picture*, 2008). In the end, however, the Army Corps underestimated the horizontal movement of the ice, and the camp, along with the larger Iceworm

project, was abandoned, but not before the world's first deep ice core was drilled, recently revealing that Greenland was ice-free within the last million years if not sooner (Christ, et. al., 2021). Remnants of the camp still persist within the melting ice, threatening to eventually release sewage and gray water, water contaminated with low level nuclear residue, fuel, and PCBs into the ocean (Vandecrux, et. al., 2021). The camp site has now become an important field site for long-term scientific studies.

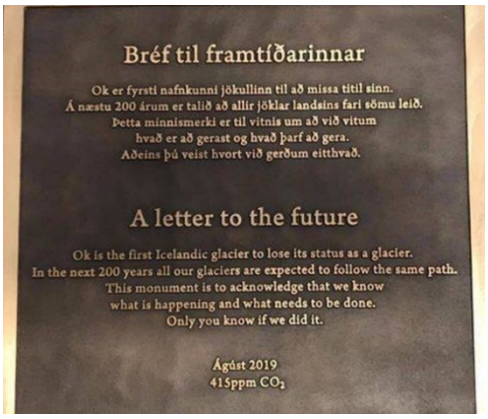

Figure 5: A plaque erected commemorating the loss of one of Iceland's glaciers—the Okjökull. Words written by Andri Snaer Magnason. Photo by Rice University/Dominic Boyer and Cymene Howe.

There are of course yet more ways of comprehending glaciers and ice, some rooted in deep cultural histories. For instance, a plaque was recently erected commemorating the loss of one of Iceland's glaciers—the Okjökull—the first of many in Iceland that are projected to be lost due to global warming. Iceland is the first nation in the world to commemorate a glacier in this manner. Cultural representations of glaciers thus continue to be relevant. Anthropologist Ben Orlove points to tensions between "western" representations and local views of glaciers (Gagne et. al, 2014, 794): glacial lake outburst floods (GLOFs), for instance, "cannot be addressed by way of the efforts of engineers alone, but must take into account the local cultural worlds and sacred geographies" (Gagne et. al., 2014, 803).

In the Icelandic creation story, as recorded in Snorri Sturluson's *Edda*, the earth was created in a land of ice and mist when frost met sparks and embers, creating the giant Ymir—the world's first creature, from whose severed body the world's elements and landscapes emerged (Faulkes, 1982)[22].

[22] Another compelling account comes from Icelandic author Andri Snaer Magnason, who takes perhaps a bit of liberty in his interpretation of the original text of the sagas: "In Nordic mythology, the world starts with a frozen cow and from this cow came the four major rivers that nourish the world. I find that the holy cow of Nordic mythology is a concrete place that I can analyse. A myth that has always been very bizarre as a source of life makes perfect sense as a metaphor for a glacier. The glaciers in the Himalayas are considered a life source, milking cows of the region" (Rawlings and Fontaine, 2019).

This cultural importance of ice is reflected in some of the writings of Gunnar Gunnarsson—a well-known 20th century Icelandic author:

> and here and there the stars glinted in the dark blackness of nocturnal ice. Such a journey was like a poem with rhymes and lovely words, it stayed in the blood like a poem, and like a poem must be learnt by heart; from the deep places of my sleep a voice came to meet me, which I instantly recognized. It was the glacier river speaking, stern and stimulating, fascinating in its rude relentlessness (in Campbell, 2018).

Since Gunnar wrote this, some of Iceland's glacial rivers, including the Jökulsá á Da and Jökulsá í Fljótsdal, have been dammed and converted into electricity, often for aluminum smelting plants. The poetic speech of these glacial rivers has been transformed into soft billets.

John Muir thoroughly understood this poetic sense of glaciers: "Viewed one by one, [glacially-carved islands] seem detached beauties, like extracts from a poem, while, from the completeness of their lines and the way that their trees are arranged, each seems a finished stanza in itself" (Muir, 1915, 12). He spoke of glaciers as "living," ice as "only another form of terrestrial love" (Bade, 1923, 266), and of what he called a "glacial gospel" (Muir, 1915, 73).

Muir is well known for his writing and advocacy on behalf of parks and preservation. Perhaps less well known is that he was also an amateur scientist (as was his contemporary Charles Darwin in his early career [Chadarevian, 1996]), and thus could, by certain lights, be considered one of the first glaciologists, though certainly not in a rigorous quantitative sense[23]. The inspirations for his science and

[23] One telling is that "Muir set out his empirical research results in glaciology, joking, 'You will have the first chance to steal'. This follows his complaint that a paper for the Boston Society of Natural History from Professor Samuel Kneeland drew from Muir's work 'and gave me credit for all of the smaller sayings and doings, and stole the broadest truth to himself'. When Muir's literary executor William Frederic Badè compiled *The Life and Letters* (1924; reprinted 1996) he tactfully omitted a paragraph from this letter in which Muir also wondered how much credit he was being given in a lecture by the Berkeley geologist Professor LeConte whom Muir had guided with his students in Yosemite two years before" (Gifford, 2011).

Science Historian Dani Inkpen however gives a very different interpretation: "Muir's visits to Alaska between 1879 and 1899 made him somewhat of a connoisseur on the subject of Alaskan glaciers, but the rambling Scotsman was more interested in exploring and experiencing than he was measuring. On the Harriman expedition of 1899—a floating association of naturalists, artists, and social elite, financed by railroad magnate Edward Harriman—Muir stood in sharp contrast with what his shipmate William Burroughs labeled the 'fearfully and wonderfully learned' men of specialized science who came armed with expert vocabularies and (to Muir) tedious methods. Their methods were those of glacier naturalism" (Inkpen, 2018, 86-87).

A final take is given by writer Kim Heacox: "during his time (and still today) [Muir] would more accurately have been regarded by friendly scientists as a glacial geologist, one who studies the impacts of glaciers on the landscape, as opposed to a glaciologist, who studies the physics and chemistry of glacial ice, its composition, and dynamics" (2014, Author's Note). "[Muir] surmised, as Louis Aggasiz had in the alps,

advocacy came from the settings in which he lived and worked—landscapes shaped by past glaciation, like Yosemite, or the heavily glaciated regions he encountered in his travels to southeast Alaska.

Muir was enamored with the awe-inspiring landscapes created by glaciers, including Yosemite's great granite cliffs and spectacular waterfalls—some nearly a half mile high. Muir's writings about Yosemite were integral to the formation of U.S. national parks. He hoped that protecting these landscapes would preserve the kind of experiences he had in them, though of course this was by no means guaranteed. In one of his last trips to Alaska, Muir wrote disappointingly of tourists who arrived in Glacier Bay aboard a steamship that "it was curious to see how promptly all of them ceased gazing when the dinner-bell rang, and how many turned from the great thundering crystal world of ice…wast[ing] their precious time prying into our poor hut" (Muir, 1915, 353).

Muir's experiential exaltation of the beautiful and the sublime as cornerstones of preservation would result positively in the creation of the U.S. National Park system, ensuring certain kinds of development and exploitation were barred from some protected areas. However, Muir's vision—his glacial gospel—has also had some negative consequences, including increased dispossessions of native peoples residing in many areas that would become national parks[24], and, through his exaltation of

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that the entire [Yosemite] region owed its morphology to glaciers. Rubbish, said Josiah Whitney, chief geologist for the state of California. What does this Muir know, this man with no academic or scientific credentials, this 'mere sheepherder,' an 'ignoramus'...Whitney insisted that the valley had been created by catastrophic down-faulting. Not glaciers" (2014, 34). And again, "While Muir made no pretense to be an academic, many in academic circles admired him. Outside of this 1870s debate with Josiah Whitney over the shaping of Yosemite Valley, wherein time would prove him right and Whitney wrong, Muir would make no major peer-reviewed contributions to the science of glaciology" (2014, 72). And finally, according to Muir himself, Louis Aggasiz stated that "Here is the first man I have ever found who has any adequate conception of glacial action" (Gifford, 1996, 322).

[24] It is probably more accurate to say that Muir's vision was utilized in these ways, as it is far from clear that this is what Muir intended. This is well documented in certain instances, including Grand Canyon and Yellowstone National Parks (see, e.g. Jacoby, 2014). Today, many Alaska national parks and a very few parks in the lower 48 permit access for subsistence hunting, fishing, and gathering. Wilderness areas designated by the 1964 Wilderness Act were created from pre-existing federal lands. It is important however to note that most park and Wilderness areas are centered in relatively inhospitable areas, e.g. high mountainous regions and deserts, and thus usually typically only hosted smaller numbers of peoples transiently and seasonally, and were thus areas "where man himself [was] a visitor who does not remain." See for example (Baker, 2002, 42): "More reliable Indian oral histories, the few reliable accounts from Euro-Americans, and tree-ring studies all do suggest that Indians influenced the fire regime in low-elevation valleys and along travel routes in the northern Rockies. Reliable evidence of burning by Indians is generally absent throughout the rest of the Rocky Mountains. Given the fragmentary nature of the evidence, it would be premature to draw sweeping conclusions about Indian use of fire, but the burden of proof must shift to those who would counter the most likely hypothesis: Indians were a small part of a large Rocky Mountain wilderness, with a fire regime in much of the mountains essentially free of human influence for millennia. 'In virtually every pre-modern society there has been a part of its territory that was its wildest place, the least-visited, the most mysterious; and that area—on whatever scale—is the working wilderness of that society. When contemporary Indians say 'We had no wilderness,' they are speaking in terms of recent bureaucratic use of the word. In truth they all had areas which were their 'wildest spaces' (Snyder 1998:38)."

landscapes capable of producing a certain type of experience as most worthy of preservation, he contributed to a deeply flawed conservation strategy. A disproportionate number of U.S. national parks are glacial landscapes: “Glaciers exist today in seventeen of the fifty-nine parks and have substantially contributed to the scenery of approximately half of all national parks” (Capps, 2017, 338). Additionally, many of the park and wilderness areas not containing glacially carved rock and moraine are deserts.

As has been widely noted elsewhere, U.S. protected areas are overwhelmingly centered on “rock and ice”—important places in their own right: for scenery, recreation, inspiration, and watershed conservation among other reasons—but are nevertheless “low hanging fruit”—less profitable for agriculture or industry and thus more easily protected without perceived financial costs. Bureau of Land Management (BLM) lands, for instance, have been called “‘the lands no one wanted,’ as they were unclaimed and unreserved during the federal government’s disposition of the public domain; ‘many viewed them as a vast arid wasteland of little use to anyone’” (Glicksman, 2014, 459). Though I do not have any precise statistics, this overlay of glaciated landscapes, and rock and ice more generally, is likely even starker for designated wilderness. A visual inspection of maps would seem to suggest so.

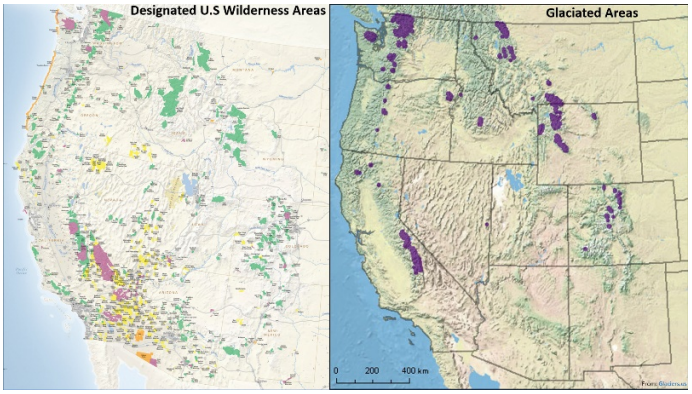

Figure 6: Maps of designated Wilderness areas in the western U.S. compared to areas with active glaciers. 1: From http://glaciers.us/images/states_map-s.jpg. Retrieved September 23, 2020.

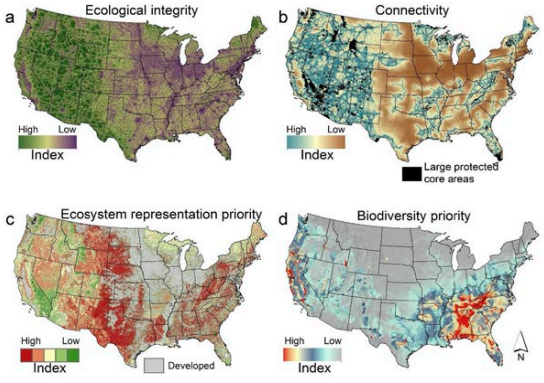

Figure 7: Contemporary scientific conservation priorities for comparison From: (McGuire, et. al., 2016)

Muir’s emphasis on visually spectacular, particularly glacial, landscapes has had two major implications: 1) it has contributed to a conservation strategy that does not include many of the most biodiverse or otherwise ecologically significant locations; 2) because of the high proportion of protected areas that contain glaciers, rapid glacier and ice loss due to climate change is having an immense direct

impact on protected landscapes. The first point necessitates a critical look at the purpose of protected areas, and a prodding into the relationship of science and experience. The second reveals an important intersection of protected areas and ice.

I will make a simple conclusion now, which I will continue to substantiate in the following chapters: though Muir's sentiments, captured in his influential writings, led to scientifically flawed conservation strategies, his experiential-poetic perception is critical for conservation and environmental management. This is captured in part by the inclusion of wilderness character narratives as an official document in wilderness management, as described above. Not only are glaciers often presented as watertowers or reservoirs, but the loss of glaciers and other large bodies of ice, including sea ice, ice sheets, and permafrost—as components of the cryosphere—are often similarly technically rendered and presented as, for instance, a loss of ecosystem services: high albedo surfaces; regulators of sea level, current, and climate; or even hunting grounds and travel corridors[25]. These ways of speaking and thinking have ethical and practical implications: they "set things up" for technical management—a possibility expressed by, for instance, geoengineering.

Likewise, the science and governance of Antarctica—home to the largest extent of ice on earth—have been characterized by Anthropologist Jessica O'Reilly as "technocratic", managed according to the dictates of an epistemic technocracy: "a mode of governance whose political technologies rely on the form (the discursive habits) and matter (the literal substance) of scientific practice" (2017, 6). Antarctica is unique in lacking indigenous people. Jessica notes that scientists are the closest thing to a native population, in contrast to, for instance, Southeast Alaska, home to the Haida, Tlingit, and other indigenous groups, who have long lived with, known, and managed glacial environments (O'Reilly,

[25] Or more recently "The Polar Research and Policy Initiative's Menezes, for example, is exploring the possibility of marketing giant icebergs that have broken off, by loading them onto tankers and shipping them to countries looking to buy high-quality supplies of water. 'It helps contribute to the consequences of climate change,' he says." (Walt, 2021).

2017). In stark contrast to this technocratic view of glaciers, anthropologist Julie Cruikshank in *Do Glaciers Listen?*, counterposes Enlightenment science with Tlingit conceptions of glaciers—as living, sentient, and responsive to human action—and John Muir's encounters with both the Tlingit and glaciers (Cruikshank, 2014). I will return to each of these accounts and this fundamental contrast in later chapters.

Science, while integral to shaping a sustainable, livable future, is also implicated in technocratic management—as is modern ethics. Without something akin to the impulse in Muir or the cultural traditions of the Tlingit—if we slip into conceiving and treating the earth as merely an engineering problem or purveyor of services—we risk living on a sanitized earth—a dystopia of total technical design.

Glaciers and ice, like wildlands, can also be subjected to the four ways of knowing nature I outlined previously, each with direct implications for environmental management:

1) "Cowboy" Glaciology: a scientifically uninformed and commodified vision of the earth's complex systems, exemplified by U.S. senator James Inhofe's infamous refutation of climate change by presenting a snowball to the senate, and the requisite climate change policy nonaction that this entails. Cowboy glaciology parallels cowboy biology as the Yellowstone situation resembles our present state of unintentional, widespread disruption of the climate caused by countless small decisions that may be motivated individually by good intentions; but at a systems levels, are arbitrary and uninformed, leading to collective harms. This planetary-scale inadvertent impact is completely unacceptable and must be a precursor to deliberate design (Preston, 2018); however, we risk falling into a dystopian alternative. Ice, here, is a highly visible, charismatic proxy for climate change, with massive global consequences, if mismanaged[26].

[26] Glaciers and ice can also be thought of in the same terms as wilderness management: as a measure for monitoring climate (rather than wilderness character). This is essentially how the cryosphere is employed by the IPCC in its special reports.

2) Technical: a modernist vision of nature known, surveilled, and managed by modern science and technology, exemplified in this case by Cold War era conceptualizations of Greenland, technocratic visions of Antarctica, and equating glaciers with watertowers and reservoirs, or aspects of the cryosphere with ecosystem services.
3) Poetic: nature known by embodied, sensual encounter, exemplified in this case by the writings of John Muir and Alexander von Humboldt (whom I will address later)[27].
4) Traditional ecological knowledge (TEK): ways of knowing nature held by Indigenous and other peoples with similar, long-standing relationships to places. This would include Greenlandic relationships with the Greenland ice sheet and marine ice, Andean and Himalayan relationships with glaciers, and Cruikshank's account of the Tlingit in Alaska (I will return to some of these in Chapter 6).

In this chapter I have given concrete examples illustrating the real-world effects of how perceptions and articulations of nature have ethical and practical implications; I have outlined four distinct ways of knowing nature, each creating or implying environmental values that are the foundations of differing forms of managing nature; and I introduced a distinction, which I will develop further, between poetics and technics. In the following chapters, I will turn more fully toward considerations of science and technology, including tracing out the lineages of thought and practice that laid the foundations for the conflict between the Craigheads and Muries, before returning to management and design, and finally to wild ethics.

[27] The ethnopoetics of ice found in anthropologist Knud Rasmussen's Eskimology could also be included here.

Chapter Three: The Technics of Modern Science, Technology, and Technocracy

Preserving wild things and places into the future is a magnificent challenge that requires far more than a simple declaration of law, the noble intentions of policy makers and managers, or the reasoned proclamations of ethicists. This necessitates a thorough understanding of technology and its close relationship with modern science, each of which are the basis for management and design. Ultimately what is required is a challenge to the "the arrogant and totalizing dimension of Enlightenment faith in absolute rational foundations for science, philosophy, economics, psychology, and politics" (Zimmerman, 1990, 258).

In the first chapter, I outlined the failings of modern ethics—modeled after modern science insofar as it accepts its lawful and algorithmic criteria for explanation. The primary schools of modern ethics—consequentialism and deontology—are united, if differing in degree, by an abstract, calculative approach. In the second chapter, I laid out two case studies, each centered on conflicts over managing and representing nature—together demonstrating the confrontation of technology and wild nature. In this chapter, I will focus on modern science and technology, and the threat of technocratic management, tracing out the genealogy that underlies the Craigheads' technological approach towards Yellowstone wildlife and the technical renderings of glaciers and ice epitomized by the U.S. Army Corp of Engineer's Project Iceworm.

Modernity, Technocracy, Technics

Modernity

By some accounts, modern technological society is not substantively different than past societies, nor is there anything unprecedented about technology besides its greater social role and potential consequences. Prominent philosophers of technology like Marshal McLuhan and Andrew Feenberg have held this view, in opposition to others, including Martin Heidegger, Jacques Ellul, Neil

Postman, and Albert Borgmann, who see in modernity a fundamental break from past epochs and a substantive shadow side unique to modern technology. Borgmann, for instance, points to Francis Bacon, Rene Descartes, and John Locke, who gave us the "domination of nature," the "primacy of method," and the "sovereignty of the individual," respectively, as definitive in differentiating modernity (1992), while others have pointed out that one key characteristic of modern science, and thus modernity more broadly, is a natural world without normativity (Rouse, 2002).

Bruno Latour, widely credited with founding science and technology studies (STS), gives perhaps the strongest rebuke of a unique modernity, declaring that we have in fact "never been modern" insofar as the processes he identifies at work in the contemporary world, purification and mediation (translation), are in fact simultaneous and intermingled, acting together to hold nature and society apart while concealing themselves (Latour, 1993). However, as mentioned in Chapter 1, constructionist accounts, including that of Latour, may be better described as hypermodern—exemplifying modernity.

For instance, one Latour critic has noted that "viewed through the lens of Heidegger's philosophy, Latour's self-description as a 'non-modern' thinker cannot be sustained. In fact, Latour's theory of science turns out to be, by Heidegger's lights, a definitively modern one" (Kochan, 2010, 580). In his analysis, some of Latour's central contributions are either essentially modern from a Heideggerian perspective, as with actor network theory, or are cheap reproductions of Heidegger's critique of technology, as with mediation—an incompletely conceived take on Heidegger's "enframing" (Kochan, 2010, 585).

Or again, as another critic has stated, "In the end, Latour's philosophy of technology appears as a mirror image of Heidegger's" in celebrating the technical mediation and symmetry of artefacts and humans that Heidegger presents as the great danger of enframing (Riis, 2008, 297). This will soon become evident when I outline Heidegger's diagnosis of modernity.

Nevertheless, Latour and STS, have made indispensable contributions to the assessment of science and technology, revealing more fully, through empirical examination, how scientific endeavors rely on embodiment, affect, and perspective; and that neither "Western," "modern," nor Indigenous views are homogenous or self-contained (Latour, 1993).

I maintain with Heidegger, however, based on his analysis of modern science, focusing mainly on Descartes, Newton, and Galileo, that modernity and modern technology are in fact unique. The hallmarks of modernity for Heidegger are the mathematical and "representational" thinking, which portrays the "world as picture" (Heidegger, 1968; 1977a). Modern thinking is defined by modern science, and thus includes ethics, leading back to my critical analysis of modern ethics in Chapter 1. "Modern" is also an important criterion in wilderness management, wherein impacts and interventions are often differentiated by whether they are the product of modern humans (Landres, et. al., 2015).

Three major aspects set modern science—and thus modern thought more generally—apart from pre-modern, including Aristotelian science.

1) Modern science is projective: a pre-determined conception—an imperative toward certainty and security—is brought to bear on experience, namely things as objects, and the mathematical.

2) Modern science is calculative: it aspires toward precision and certainty as "exact numerical analysis"—the "mathematical" in a narrower sense than Heidegger's more encompassing conception. Heidegger equates calculability with controllability (Heidegger, 2009).

3) Modern science is experimental: ordinary experience is discounted in favor of observations in a controlled, constructed setting (in which conditions are "set up" through intervention), wherein a single instance (presumably repeatable merely for accountability purposes) holds sway over everyday encounters with things.

Technocracy

"Whence do the sciences—which necessarily are always in the dark about the origin of their own nature…derive the right to decide what [human being's] place is, and to offer themselves as the standard that justifies such decisions?" —Martin Heidegger (1968)

Technocracy, broadly conceived, is a state of governance in which technical expertise and scientific administration usurp democratic participation, such that technical control comes at the expense of tradition, preexisting values, and substantive ethical deliberation (Feenberg, 2010; Glenna, 2010). Technocracy is also a form of management in which nature is both portrayed and administered technologically. It is thus related to Max Weber's observation of modern disenchantment in which the "haunting, colorful, exceptional" is "routinized and filtered through governance" (O'Reilly, 2017, 34).

Critique of technocracy has been an important component of critical theory, particularly in its early manifestations, including Marcuse's assessment of "technological rationality" and the "totally administered technological world," Adorno's "rational critique of reason," and to a lesser degree in Habermas's concern with "the growing predominance of system over lifeworld" (Feenberg, 2010, 59). Each of these thinkers is however overwhelmingly concerned with the social repercussions of technocracy, the first sense I define above, including its negative impact on democracy and economic equality.

Technocratic management is a central concern in critical theory, insofar as it is employed in capitalist exploitation of labor by acting technically on persons, thus curtailing human autonomy and freedom. For instance, Andrew Feenberg, who relies heavily on the critical theory of technology, defines technocracy as "subjecting human beings to technical control at the expense of traditional modes of life while sharply restricting participation in design" (2010, 71). He means this particularly in a context of western capitalist industrial production and thus he reinterprets Max Weber's and Heidegger's insights

into technology as culturally relative, rejecting any trans-cultural essence of technology[28]. He maintains that technology has developed as it has due to western capitalism, and he thus calls for a technical democracy—primarily centered around a more participatory (socialist) realm of work and industrial production. But his analysis only begs the question: why is capitalism is as it is? This leads back to the necessity of Heidegger's epochal analysis of western metaphysics.

Feenberg's focus on the technocratic threat to democracy is important but misses the core of Heidegger's assessment: his attention to things. Heidegger's focus is also more relevant to my primary concern—technocratic management of the wild, with the understanding that this inevitably circles back on human beings, sometimes directly, and sometimes indirectly via Churchill's Principle, when the shape of our material world creates and constrains human potentialities.

Feenberg and critical theorists do nevertheless have important relevant insights to this concern. For instance, Feenberg observes that management documents and planning, in its technical manifestations, de-worlds (decontextualizes): "And as with technology, bureaucracy loses much of the richness of the lifeworld" (2010, 169). The lifeworld in this context is "an original realm within which human identity and the meaning of the real are first and most profoundly encountered" (2010, 147).

An extreme form of this de-worlding might be the utopian ideal of "a system of perfect computer-guided ecomanagement" (Böhme, 2012, 20). This expression of technical utopia finds a likeness in the possibilities of science as the basis for ecological management: imagine a series of computer-guided drones, stationary automated ecological monitoring stations, and satellite remote sensing, piping information to a computer equipped with AI software, which compiles all these measures, integrates them into models, and perhaps even offers suggestions for management decisions—a fully disembodied management system[29].

[28] Even a cursory look at the use of technology for social domination by authoritarian nations like Russia and China casts significant doubt on this position.
[29] This practically already exists. See (Adams, 2018).

Wild protected areas are meant, hoped, thought, to be exceptions from the system of total technological management—perhaps the most viable outlet from the "iron cage." This contrasting quality of wilderness is important for many reasons: among many possibilities, one is a basic respect for autonomous evolutionary processes, while another is as a concentrated dose of the "grounding substrate" for meaning and identity that we derive from encounters with nature (Mill, 1977, 756). Nevertheless, we now face the prospects of the technosphere subsuming the ecosphere, erasing any such exceptionality of wild nature (Commoner, 1990).

In sum, in addition to critical theory's important social critique of technocracy, which only addresses nature abstractly and distantly, an alternative critique from what might playfully be called "the other critical theory"—which may include writers and thinkers such as H.D. Thoreau and Edward Abbey—is in order. Wild ethics includes, but moves far beyond, critique, however, providing a robust positive formulation. The culmination of this dissertation will be the beginnings of just such a formulation. First, however, I offer a more thorough consideration of technology via an explication of technics and modern science. In the following two chapters, I will then distinguish technics with alternative possibilities for science, and poetics, respectively.

Technics

I identify here several (nine to be exact) key aspects of what I refer to, following Lewis Mumford, as technics. By technics, I mean something broader than technology, as the word is used in typical discourse—something more akin to the sense of technology provided by Heidegger, which includes how we apprehend and represent the world. Any particular expression of the technical need not of course meet all of these characteristics. What unites nearly all these aspects is that they are the product of apprehending the world as a "pure disincarnated rationality" (Feenberg, 2010, xx). Ultimately, technics, in its various aspects, must be overcome and directed by poetics.

1) Rationalization: By one definition, rationalization is "the generalization of technical rationality as a cultural form, specifically, the introduction of calculation and control into social processes with a consequent increase in efficiency," and with a subsequent reduction of the "normative and qualitative richness" of the traditional social world (Feenberg, 2010, 130).

Rationalization is best known as one of Max Weber's key contributions toward social analysis, closely related to his metaphor of the "iron cage" of reason. Though intended primarily in Weber's analysis as an internal form of self-constraint—an "innerworldly asceticism"—this regulative rationality may now be more obviously manifested in external controls, traffic signals for instance. These external controls however are still contingent on the individual's internalized self-regulation (Böhme, 2012).

Andrew Feenberg describes Weber's rationalization as the distinctly modern propensity, particularly in organizational settings, to "conform to principles or employ methods involving precision in measurement, accounting, and technical insight" (2010, 158). His derivate sense of social rationalization involves the following principles: "1. exchange of equivalents, 2. classification and application of rules, 3. optimization of effort and calculation of results" (2010, 159). Feenberg further observes that "the most powerful critiques of modern technological society follow directly in Weber's footsteps," particularly Heidegger and Ellul (2010, 7).

2) Procedural (Methodical): As I described in Chapter 1 when I applied a critique of professional ethics to theoretical ethics more broadly, technics in an ethical context can be understood as procedural or methodical insofar as ethics is reduced from internalized, expansive deliberation to standardized, externally imposed protocols.

Moving beyond ethics, technical action is that which is accomplished according to uniform, impersonal procedures that anyone (or any machine) can do. Heather Douglas refers to this as

procedural objectivity: “The key to procedural objectivity is that regardless of who engages in a procedurally objective process, if they commit no clear errors, they do it in the same way, producing the same result.” This is typically accomplished through “a very clear and rigid quantitative form with which to process information” (2009, 125). She gives the example of a standardized test as an exemplar of this approach. Even though nuances and complexity, as well as individual judgement and values are left out, values are still encoded in the process when the procedure is initially encoded.

This impersonal aspect is well summarized in Feenberg’s example: “The most humane of values, for example, compassion for the sick, is expressed technically in objective specifications such as a medical treatment protocol…the protocol can be followed without compassion” (2010, 150). Technics in this case flattens the complexities of human relational interaction to impersonal procedures.

3) Substitution (Internalization): The primary form of substitution in this sense is the technological fix—Alvin Weinberg’s 1967 term for “the strategy of substituting an engineering solution for a difficult social or behavioral problem” (Preston, 2018, 119). Examples of this might include the hypothetical possibility of a medical solution in the form of a malaria vaccine versus a more comprehensive and less reliable integrated vector management approach (“a combination of bed nets, medication, spraying, and environmental management”), necessitating complex social organizing tailored to specific settings and locations, with inevitably unreliable local participation.

Similarly, deafness may be seen as a simple technological solution requiring implants, but only at the exclusion of more complex social and justice considerations involving a more expansive perspective of deafness, not as a deficiency to be solved, but as a component of human cultural diversity that ought to be preserved (Allenby & Sarewitz, 2011, 57).

More relevant to the primary topic of this dissertation, climate engineering is the deliberate manipulation of global climate through large-scale interventions, potentially accomplished via carbon

dioxide sequestration, solar radiation management (the injection of reflective particles into the upper atmosphere), the creation of algal blooms by dropping iron fillings into the ocean, or even the strategic distribution of silica throughout the Arctic to imitate the albedo effects of disappearing ice[30]. This circumvents the far more complex requirement of drastically remaking the global industrial economy so as to limit greenhouse gas emissions, deforestation, and other large-scale environmental impacts.

Technological substitution is closely related to the technological internalization of processes. This internalization "render[s] context irrelevant." In the case of a hypothetical malaria vaccine, for instance, any substantive need for local tailoring of preventative measures is negated, and instead "much more of the intervention—the action that leads to the desired outcome—would be embodied in use of the technology itself" (Allenby & Sarewitz, 2011, 50). This "pushes the complexity of the larger system to the background by embodying most of the relevant cause and effect of the immediate problem in a technological solution" (Allenby & Sarewitz, 2011, 55).

A fishing boat does this, by, for instance, safely and efficiently navigating waterways, but only to a point: the fisheries system as a whole cannot meaningfully be internalized. Furthermore, there can be incompatibilities between the technological device and the system within which it interacts: more efficient fishing boats more readily devastate their environments. Similarly, climate engineering measures such as solar radiation management have their limits: they do not solve ocean acidification nor provide a long-term solution, for as soon as these active measures cease, the tremendous buildup of greenhouse gases that has continued to accrue in the atmosphere will have immediate catastrophic effects.

4) Action Independence (Decontextualization): Andrew Feenberg notes that a key characteristic of technical action, as distinguished from everyday reciprocity, is "the apparent independence of actor

[30] See Arctic Ice Project: https://www.arcticiceproject.org/technology-focus-areas/

from object" such that "the technical actor stands in an insulated, external position with respect to his or her objects" as a "pure disincarnated rationality, methodically controlling and planning" (2010, xx).

An example of this insulation is the slight movement of an automobile driver's foot leading to the drastically disproportionate effect of a vehicle speeding down the highway. This insulation however is not complete. The driver's disproportionate action leads to fossil fuel combustion, which ultimately circles back as climate change. There are echoes here of Borgmann's device paradigm, where the means, and thus the full range of effects, are hidden in the frictionless procurement of a commodity.

This insulation, which Feenberg refers to as autonomization (2000), is accompanied by a "shattering" of the (life)worlds to which things belong—a decontextualization or de-worlding, an abstraction from social and natural conditions—which "tears [things] out of their original contexts and exposes them to analysis and manipulation while positioning the technical subject for distanced control" (Feenberg, 2010, 150). Once something has been reduced to its purely technical aspect, it can be freely adapted to different social contexts. Feenberg refers to this entire process as primary instrumentalization, arguing that this aspect of the technical is what technology theorists like Heidegger, Ellul, and Borgmann identify as the essence of technology.

He claims however that these theorists miss the secondary instrumentalization by which technologies are reintegrated back into social contexts (this rift between the two types of instrumentalization being unique to modern society) because they lack the empirical dimension later developed by science and technology studies. They also reify a type of reason as definitive of technology, which is instead unique only to western capitalism.

Feenberg's primary concern is the subversion of democracy by these instrumentalizations. His solution is, among other things, a restoration of traditional secondary instrumentalizations and a technical democracy (2000). His analysis however focuses almost exclusively on the social dimensions of technology. Feenberg seems to believe that a spontaneous process of secondary instrumentalization is

sufficient to overcome the primary instrumentalization of technology. While this may be true to a greater degree, though not fully, at the social level, his analysis is misguided when applied to the tension between human design and the environment, particularly wild nature.

5) Disassembling (Simplification): Romantic poet William Wordsworth famously mused in *The Tables Turned* that…

> Our meddling intellect
> Mis-shapes the beauteous forms of things: -
> We murder to dissect[31].

Rousseau likewise reacted to an emerging, distinctly modern, splintering of disciplines, and to the parallel emergence of modern scientific disciplines such as pharmacology or botany. Contrary to the naturalist tradition that predated them, these newer sciences, according to Rousseau, reduced plants to "simples," viewing them only through the lens of "utility," particularly in the process of grinding plants in a mortar (Kuhn, 2009). Rousseau observes that:

> [M]edicine has taken possession of plants and transformed them into simples to such an extent that we see in them only what we do not see in them at all, to wit, the pretended virtues it pleases anybody to attribute to them […] All these charming and gracious structures barely interest anyone who only wants to grind it all up in a mortar (Rousseau, 2000, 1063).

And further that "as soon as its form is destroyed and ground in a mortar it is no longer anything to [the botanist]" (Rousseau, 2000, 251). Rousseau refused to participate in this sort of study, preferring instead a botany that engages in "pure and disinterested contemplation" (Rousseau, 2000, 1065).

[31] Aldo Leopold in *A Sand County Almanac* similarly muses that "There are men charged with the duty of examining the construction of the plants, animals, and soils which are the instruments of the great orchestra [of nature]. These men are called professors [of science]. Each selects one instrument and spends his life taking it apart and describing its strings and sounding boards. This process of dismemberment is called research...One by one the parts are thus stricken from the Song of Songs. If the professor is able to classify each instrument before it is broken, he is well content" (Leopold 1949, 142), as does David Abram: "the living person now an epiphenomenon of the anatomized corpse" (1997, 34).

Heidegger identifies a similar process at work in technology. All things, animate and inanimate, human and nonhuman, are "skipped over," challenged to be revealed as *Bestand*, or standing-reserve. Heidegger identifies this revealing with energy, as described by theoretical physics, which can be unlocked, transformed, and stored. Everything is ultimately reducible to a homogenous, calculable energy when broken apart and simplified in order to be studied or made use of. Through the lens of technological revealing, a thing "is no longer anything." This seeing is already found in the processes at work in modern science identified by Rousseau over a century before Heidegger. The ultimate version of this dissembling is *Bestand*, understood as energy, which finds its apex in quantum theory:

> *Bestand*, as energy, is something that does actually inhere in the physical substance of matter, but in order to relate to beings as *Bestand*, one must not only conceptually skip over the thingness of things, but one must physically do "violence" to matter in order to extract and store the energy within it as standing reserve (Beattie, 2016, 424).

Taking a broader perspective, Heidegger notes that the ancient Greek term for "theory" was transformed by Roman *contemplari*, whose etymological root is *templum*, derived from the Greek for "to cut or divide." A more primordial sense of theory was thus transformed into contemplation, which is more akin to our present sense of theory—what Heidegger calls "a looking-at that sunders and compartmentalizes" (Heidegger, 1977b, 50-1). Heidegger sees in this fragmentation an inherent violence toward things, evident, among other ways, in the compartmentalization of disciplines (Glazebrook, 2000, 103). Habermas gives a very similar prognosis in identifying a "severance of spheres" in modern scholarship, particularly between art, morality, and science—amplified by "cultures of expertise" (Halliwell, 2016, 2). All of this of course has roots in Descartes's method.

Edward Mooney notes that this aspect of technics extends well beyond science, offering similar reflections to those of Heidegger in a critical examination of academia more broadly. In academia (particularly in analytic philosophy), we find "thoughts and texts chopped into bits; feelings for the living whole of things, cognitive and affective, sidelined or gently mocked" (2015, 33), wherein it is the role of

"abstract reason to disassemble [these reflections] into lifeless components" (Mooney, 2009, 26). It is partly in this sense that, as I described in Chapter 1, philosophy, including modern ethics, has given way to technology. Ultimately, this dismemberment also endangers human beings insofar as we ourselves become technological (non)objects, split and synthesized (Schmidt & Marratto, 2008, 176).

6) Functional Reductionism

As noted above, Rousseau reacted to modern science's tendency to reduce plants (and other things) to their "utility"—to instrumental values. At its broadest level, this is a reduction of things to their function. Feenberg observes that "Technological thinking isolates function…an abstraction from the totality of the thing, function is substituted for the whole" (2010, 190). Technical disciplines, engineering for instance, can then also be isolated and made to subsist on their own.

This reduction comes at the expense of meaning, which according to Feenberg is largely what Heidegger means by "essence": "technological thinking eliminates the essences that preceded modern science and reduces meaning to function," which is accompanied by an "elimination of teleology and ritual significance [such that] nature is available for analysis and quantification" (2010, 193). Biomimetics, for instance, while in one sense commendable for seeking out nature as a model for human adaptation, studies nature from a purely technical standpoint insofar as it reduces natural things to their function (Böhme, 2012, 154).

7) Mathematical: As I will discuss in detail below, the mathematical is, for Heidegger, the defining feature of modernity—its basic structure—and thus the essence of modern science and technology. The mathematical is not equivalent to mathematics, though this epitomizes it. The mathematical is an a priori projection of certitude brought to bear on experience such that things themselves are "skipped over." This is the foundation for a mechanistic conceptualization of nature following the scientific

innovations of Galileo, Newton, and Descartes. It is thus "the relation between metaphysics and science" (Glazebrook, 2000, 14).

Mathematics itself is a way of seeing the world and a powerful basis for decision making. The phenomenological world however must first be translated via a process that has been identified as a mathematical transformation, wherein a formal reduction reduces experience to primary qualities, a system reduction simplifies real-world complexities (by for instance idealizing physical entities for the purposes of modeling and calculation, as with friction or shape), and inscription encodes values into mathematical representations (Christensen et. al., 2008).

The mathematical, according to Heidegger, is furthermore set up as the standard for all modern thought, including, as I have argued, modern ethics.

8) Experimental: Closely related to the mathematical, the experimental is a "setting up of nature on the basis of an a priori conception" (Glazebrook, 2000, 7), such that active intervention becomes seen as natural—merely an extension of the lawful propensities of matter rendered cleaner and purer in laboratory conditions. Modern science is not only distinguished by its a priori projection of the mathematical, but by an empiricism defined by the experiment, in contrast to a pre-modern, specifically Aristotelian, experiential epistemology. One author explicitly identifies the experimental with the technical insofar as "Modern natural science defines itself as the investigation of nature under technical, i.e. experimental, conditions" (Böhme, 2012, 7).

9) Change of Structural Conditions (Dispositif): This quality of technics, unlike the other eight, is more specifically focused on technology in its material manifestations. A given technology goes beyond its intended function and transforms the conditions that enable its deployment (often beyond recognition). Rather than increasing the efficiency of a given system, technology fundamentally alters the basic

underlying structure. The internet for instance is not merely a more efficient means of communication, but a new form of social interface and arrangement. The train likewise wiped away an entire lifeworld and necessitated the emergence of a new one built around itself. Air travel substitutes the "experience of a physical path between two places with a period of time spent in the hermetically sealed confines of a plane's cabin." These are "structural changes which exceed the scope of concepts like rationalization" (Böhme, 2012, 18; 17).

This limiting and enabling aspect of technology, which now operates as the fundamental precondition for nearly all aspects of contemporary human life, can be thought of as a *dispositif*—Michel Foucault's term for "a conditioning factor that makes something else possible but also limits it, thereby giving shape to what it makes possible" (Böhme, 2012, 7).

My intention in describing these nine qualities of technics is to outline the factors underlying the technological management of nature, and ethics and academic culture more generally. This is in contrast with poetics to which I will return beginning in the following chapter.

Heidegger's Philosophy of Science and Technology

Many alternatives have been proposed in place of modern ethics: virtue ethics, narrative ethics, ethics of care, real ethics, ethics based on a reanimation or reenchantment of nature, a focus on culture or ethos rather than rules or obligations, a personal or self-transformative ethics, a renewed sense of natural law, or simply muddling. I will address several of these attempts when I develop wild ethics in the final chapter.

Here, as an initial step beyond modern ethics and towards wild ethics, I will focus on science and scientific practice as I move towards a general division between the technical and the poetic, and the practical and ethical necessity of coordinating these. I focus here on science because in Heidegger's

analysis modern science is the essence of modern thinking and thus of modern ethics, because of its integral role in ecological management, its centrality in Heidegger's critique of technology, and because "thinking through Heidegger's philosophy of science is preparation for an ecological ethic" (Glazebrook, 2000, 253).

I have just laid out several key characteristics of what I refer to as technics. Heidegger singles out what he calls the mathematical as the essence of modern thinking and thus of science and technology: "modern science, modern mathematics, and modern metaphysics sprang from the same root of the mathematical in the wider sense" (Heidegger, 1967, 97). And though he does not explicitly mention ethics here, he does often reference modern thought as a whole. I discuss in detail below what Heidegger's sense of the mathematical is and why he deems it so important. I also expand upon the closely related experimental nature of modern thought and other aspects of technics.

In this section, I rely heavily on Heidegger's analysis of science and technology. Though this is widely regarded as indispensable, it must be acknowledged that Heidegger is a controversial figure, primarily due to his membership in the German Nazi party. There has been an ongoing and worthwhile debate about to what degree, if at all, Heidegger's unsavory political involvements color his philosophy, and if his thinking can be meaningfully separated from his politics[32]. I believe these can be separated—that we can denounce his political views (or at least his affiliation with the Nazi party), which I do—and yet fully engage with his philosophical contributions, recognizing their substantial importance. This debate will almost certainly continue and only time will tell how history will view Heidegger[33].

For the purposes of this dissertation, I nevertheless choose to incorporate aspects of Heidegger's thought, while acknowledging his shortcomings. Heidegger's legacy is severely warped by his Nazi affiliation, but I believe his immense and important insights can be redeemed. Former Harvard

[32] Can freeways be discussed or even appreciated without also discussing Naziism since they were a Nazi invention?

[33] See Appendix A at the end for some brief reflections on Heidegger's Nazi involvement.

philosopher Stanley Cavell barely broached the comparison of Heidegger's writings to the work of writer and philosopher Henry David Thoreau, penning a single short article on the topic (2002). There are substantial commonalities between the concerns of these two thinkers. Wild ethics, as I will show later, relies more on Thoreau, whose progressivism is clear. Yet, Heidegger's thought is more systematic and provides crucial critical insights into technology and modernity, and thus must be first considered before returning to Thoreau and wild ethics.

Heidegger is in some ways an odd choice for formulating any form of ethics as he himself avoided direct engagement with the topic. Nevertheless, several of his contributions are applicable, including being-in-the-world (our pre-reflective, pre-theoretical involvement in the world), his critical reflections on science and technology, his sense of letting beings be, and his focus on the role of feelings and mood (Paul, 2017). His contribution to ethics may be indirect, by way of ontology and by formulating an alternative ethos of care and of world embeddedness. A commentor has observed that "the contemporary notion of environmental crisis is being dominated by the discourse of natural sciences and the ways to overcome the crisis are also being delineated by scientists and conservationists" (Paul, 2017, 88). Heidegger's philosophy challenges this trend, pointing instead to our relations with the environment, such that environmental crises may be partly an outcome of science's presentation of the environment. In the end however I move beyond Heidegger using his own thought as a springboard for my own.

l begin this engagement with Heidegger by briefly outlining his theory of technology. I have tried here to give a well-rounded portrayal of Heidegger's thought including many of his obscure and patently inaccessible phrasings, while attempting simultaneously to clarify his meanings in more comprehensible ways.

Technology and Calculative Thinking

The Question Concerning Technology is Heidegger's primary work on the topic. In it, he makes the counterintuitive assertion that the essence of technology is nothing technological. We must therefore look beyond technology to grasp it. To accomplish this, Heidegger appeals to the Greek sense of truth as *alethia*—how things in the world are revealed to us. This contrasts with truth as propositional correctness or correspondence, as is more typical in philosophy or the sciences—and is a conception that stands apart from the metaphysical tradition running from Plato to Nietzsche.

The essence of modern technology is found in what Heidegger calls the framework: "We now name the challenging claim that gathers man with a view to ordering the self-revealing as standing-reserve (*Bestand*): *Ge-stell* [enframing]" (Heidegger, 1993, 324). In other words, technology places all things, from rivers to monkeys, into a framework of resource (standing-reserve) by challenging beings to be stored and set aside as expendable, on-demand commodities, wherein the things themselves "disappear" as resources. Everything is thereafter revealed as a commodity or resource to be manipulated, eventually also including human beings. *Ge-stell* is thus a "projective revelation of beings" (Glazebrook, 2000, 209)—a form of world disclosure that has given rise to industrial production and the modern worldview (Zimmerman, 1990).

Heidegger initially identified an a priori projection—a *Ge-stell* (framework)—of things as object, later shifting his thinking towards finding the essence of modern science in technology, arriving finally at a *Ge-stell* of standing-reserve in the *Question*. Heidegger's conception of projection is of an historically contingent *Ge-stell* that develops beyond human will, and has developed such that a *Ge-stell* of things as object precedes a *Ge-stell* of things as resource—though the latter is really just a reformulation of the former (Glazebrook, 2000, 241 + 7). His thinking thus progressed from a revealing of things as objects towards revealing as standing reserve.

Dasein—Heidegger's term for a human being—is a clearing or nothingness in which Being can be revealed, though most portrayals of humanity conceal this. This concealment has led "to technological nihilism in which everything—including humankind—stands revealed as raw material for the goal of greater power and security" (Zimmerman, Heidegger, 4). This has been described as more than simply an attitude, but a cultural form in which everything becomes available for control (Feenberg, 2000).

Heidegger's philosophy of technology is an outgrowth of his analysis of science. This is evident in the *Question* when Heidegger states that "The modern physical theory of nature prepares the way first not simply for technology but for the essence of modern technology. For already in physics the challenging gathering-together into ordering revealing holds sway" (Heidegger, 1993). This however is distinctive of modern science, rather than science in its other variants. Modern science in particular is technological and "has nothing to do with the inner truth of natural science" (Heidegger, 2014, 1980).

Heidegger elsewhere expands on his conception of technology by distinguishing between calculative and meditative thinking. In calculative thinking, which "plans and investigates," "the mind is reduced to a 'technician of calculations'" (Lin & Brakel, 2014). He paradoxically asserts that while this is not necessarily related to numerical calculation, it always computes. Meditative thinking, in contrast, involves an openness to "the mystery," while contemplating "the meaning which reigns in everything that is" (Heidegger, 1966a, 46). Our human essence is found in meditative thinking, and thus the danger we face as human beings is not only that technology could destroy us materially, e.g. via the atomic bomb, but that our nature and core will be "laid waste" when calculative thinking displaces other forms of thought.

The *Question* discusses the implications of viewing all things as resource, while this distinction in types of thinking draws attention to the danger of thinking only in calculative terms. Together, these reveal a persistent theme throughout Heidegger's thought—the role of calculation and representation

in our thinking. Representational thinking, definitive of modern science, understands truth as correctness and "thinks by means of subject and object" (Glazebrook, 2000, 164 + 226). Heidegger however is hostile to "modern science's way of representing" which "pursues and entraps nature as a calculable coherence of forces" (Heidegger, 1977a, 326), necessitating that "nature reports itself in some way or other that is identifiable through calculation" (Heidegger, 1977a, 328).

Heidegger claims that we live in an age of thoughtlessness. This lack of thought persists even in the midst of calculative and representational thinking insofar as these are oblivious to meaning. Modern thought reduces our understanding of *cause* solely to efficient cause, thus eliminating meaning and purpose—Aristotle's final cause or *telos*—from nature (Glazebrook, 2000, 230-1). In this way, even "science does not think" (Heidegger, 1968). As I shall show later, for Heidegger, things lose meaningful significance in the Newtonian projection.

Heidegger's insistence that we have neglected Being, is, in one interpretation, a convoluted way of saying that we have lost a sense of meaning and purpose in things beyond those we attribute to them[34]. This loss of meaning and purpose in nature contrasts with the pre-modern natural law tradition, which, again, is a kind of transcendental moral realism—wherein meaning and purpose can be discovered by philosophical reflection and right action in accordance with the order of the universe. In this way, representational thinking is nihilistic, and it is here "in representational thinking that science and technology coincide" (Glazebrook 223). We thus live in era of technological nihilism.

[34] e.g. Feenberg, 2010 + "power of human beings to provide the ground for Being (meaningfulness) to emerge" (Paul, 2017, 95)

The Mathematical Essence of Modernity

"Modernity achieves its inception and underlying mathematical structure in the thought of Newton, Galileo, and Descartes" (Beattie, 2016, 186)[35]

Heidegger's sense of the mathematical is key to his philosophy of technology and modernity: "Modern Western thought," to include science, technology, and ethics "has its essence in the mathematical projection of the real" (Tomaz, 2017, 274)—"a projection which determines the real and how we investigate it" (Braver, 2009, 81). Heidegger scholar Michael Roubach draws the strong connection that for Heidegger "the mathematical projection serves as a general ontological framework for modernity itself" (Roubach, 2008, 88). The mathematical nature of modern thought, based on the projection of a priori certainty, is also reflected in modern ethics' desire for an ethical algorithm.

The mathematical is not necessarily numerical (it is not equivalent to mathematics), though this epitomizes it. It is instead the epistemic certainty that reason brings to bear on experience—an a priori projection of the understanding. For his wider sense of the mathematical, Heidegger relies on ancient Greek etymology: *Mathēsis* (μάθησις) and *mathēmata* (μαθήματα) applied more broadly to learning or that which is learned (Galloway, 2019, 104). Heidegger interprets these terms thus: "Precisely this 'taking cognizance' is the genuine essence of learning, the mathesis. The *mathemata* are the things insofar as we take cognizance of them as what we already know them to be in advance" (Heidegger, 1967, 73). We confront nature knowing what we want ahead of time: results in the form of mathematical certitude. As I shall show in the next chapter, this differs markedly from Humboldt's approach to nature, which he adapts from Goethe, and offers an important corrective to the mathematical approach.

[35] *Heidegger's Mathematical Dialectic: Uncovering the Structure of Modernity* by Darren Jeffrey Beattie. Beattie's brilliant analysis, has like Heidegger's, been corrupted by his despicable politics. Also, like Heidegger, I do not believe his political views are embedded in his reflections on mathematics, or even in his brief academic considerations of politics in this writing.

Loss of Things

"Mathematics is the opposite of letting things show by themselves" –Tales Tomaz (2017)

Prior to *The Question*, in *Conversation on a Country Path*, Heidegger commented that "the program of mathematics and the experiment are grounded in the relation of man as ego to the thing as object" (Heidegger, 1966b, 79). And again, in *The Age of the World Picture*, Heidegger states that "calculation represents beings reductively as objects" (Heidegger, 1977a, 109). Pointing towards the mere disposition towards things as objects—the basis for object-ivity—as a fundamentally problematic aspect of modernity might seem a weak and utterly counterintuitive stance, but this has the radical effect of hollowing out both things and everyday experience.

As mentioned, in modern thought, things are stripped of meaning and independence while everyday experience is rendered unreliable and derivative. This is due to a combination of Cartesian subjectivism, where knowledge is grounded in the thinking subject rather than the thing (Glazebrook, 2000, 6), and Galilean-Newtonian physics, each of which, in their rejection of scholasticism, also discount an Aristotelian scientific approach toward knowing grounded in everyday encounter (Ortín Nadal, 2019, 4). In this sense, modern science is no longer experiential.

Heidegger provides the cases of Galileo's free-fall experiment and Newton's law of inertia to demonstrate this shift. According to legend, Galileo is said to have dropped two objects of differing masses from the tower of Pisa to test the equivalent acceleration of bodies regardless of mass. Three important things are evident in Galileo's approach towards nature:

1) Galileo brings an a priori hypothesis of a universal law prior to the experiment, which can be rendered mathematically. Otherwise put, he begins with an idea (or "predetermining concept"), rather

than the things themselves (Glazebrook, 2000, 96). Newton radicalizes this approach—positing an underlying homogenous reality such that space and position replace place, and all beings and their motion are ultimately commensurable—originating from the distinctly modern imperative towards certainty and security (Beattie, 2016, 115). For Newton too, the mathematical—understood as more ultimately real—precedes concrete experience. This differs from the Aristotelian approach wherein the mathematical is abstracted from concrete experience and is thus an impoverished abstraction (Glazebrook, 2000, 83). Moving beyond Newton, quantum physics, in Heidegger's view, is a narrowing of Newtonian-Galilean physics, such that the real is measured rather than simply measurable and is thus "the most technological science of all" (Glazebrook, 2000, 247).

2) Galileo is concerned with idealized things, contrary to experience. Though Galileo would have actually observed the two objects to hit the ground at slightly different times, thus accelerating at slightly different rates, his interpretation reflects his mathematical hypothesis. He attributes this discrepancy to invisible air friction, ensuring that the basic form of his hypothesis remains intact—bodies are guided by uniform laws, wherein motion shifts from an internal property of bodies in relation to specific places as in Aristotelian physics, to a product of external forces in Galilean-Newtonian physics. Moreover (and perhaps more compellingly), two objects in simultaneous free-fall is not a phenomenon encountered in normal experience. It is instead a deliberately constructed event to illustrate a larger theoretical principle.

In Newton too, there is a radical schism between the underlying explanatory account and what is actually experienced. Like Galileo's interpretation of the discrepancy between the (artificially constructed) experience of free-falling objects and his interpretation of the underlying principles at work, Newton interprets, contrary to experience, that circular motion is really a kind of linear motion: "Every body, left to itself, moves, uniformly in a straight line. According to this, a force is that whose

impact results in a declination from rectilinear, uniform motion" (Heidegger, 1967, 91). The classical position, which persisted through the Middle Ages, was rather that the circular motion of the heavens (celestial bodies) is guided by a qualitatively different ("perfect") form of movement than that of the terrestrial realm. Newton gave instead a cosmology of uniformity.

In Newtonian physics, there is thus "a radical separation between its underlying account of the nature and behavior of beings (as objects in homogeneous space), on the one hand, and the manner in which human beings have concrete encounters with such beings in their factic, everyday particularity" (Beattie, 2016, 107). Newton's First Law concerns a body "left to itself," which Heidegger observes does not and cannot exist: "there is no experiment which could ever bring such a body to direct perception" (Heidegger, 1967, 89). Newton thus posits "an interpretation of things (bodies left to themselves) that need not relate to the way things actually appear in empirical reality" (Beattie, 2016, 100-1). Kant would go on to appropriate Newton's projection in his sense of space, stating explicitly that it cannot be encountered empirically (Beattie, 2016, 117).

3) For Galileo, an individual instance trumps a series of observations. Galileo brings a general hypothesis that he wishes to test in an experiment rather than starting with repeated experiences of the typical behavior of nature—in this case falling objects—from which he then generalizes a principle. Heidegger describes this as "the transformation of the essence of reality from essentiality to individuality. Only under this prerequisite can an individual result claim strength of ground and proof of validity" (Heidegger, 1989, 75).

Though repeatability is often thought to be a criterion of success in experimentation, this can be better interpreted as an accountability measure, an opportunity to refine methods, or the lingering hopes of those clinging to entrenched theories wishing to find a flaw in the experiment, rather than an

epistemological necessity (Glazebrook, 2000, 87). Indeed, Newton himself "claims explicitly that he requires 'the proof of but one experiment'"—an *experimentum crucis* (Newton, 1953, 4)[36].

The sum total of this methodological, epistemological, and metaphysical transformation is that things are "hollowed out." In Heidegger's words, Galileo's and Newton's modern science "skips over the things" so that "bodies…have no special traits anymore" (Heidegger, 1967, 88). The Newtonian projection skips over the "qualities *specific to* and *inherent in* the natures of the things and places themselves." Heidegger scholar Darren Beattie interprets this as neither a negation or ignoring of the empirical, but as a subsumption into a "de-thinged" projection of uniformity (Beattie, 2016, 101). More radically though, this may be seen as a crucial shift in the emphasis of science from the empirical to the experimental (Glazebrook, 2000).

The modern epoch is thus uniquely defined by this "skipping over" things: the mathematical projection. This leads ultimately to a movement beyond the object—a nihilistic abstract annihilation of things, which precedes the physical annihilation of things: "Whatever stands by in the sense of standing-reserve no longer stands over and against us as object[37]" (Heidegger, 1977b, 17).

[36] Karl Popper likewise gives a key role to the singular instance, but only in falsifying rather than verifying a theory, and only logically rather than methodologically: "The logic of his theory is utterly simple: a universal statement is falsified by a single genuine counter-instance" (Thornton, 2021). Heidegger's point about encountering things repeatedly outside of a manipulated setting is nevertheless still insightful. This should not however be interpreted to undermine the singularity of encounter (to which I will address later) or even the non-typical behavior of things, a spectacle in nature that may happen only once.

[37] "Object" here is translated from the German "*Gegenstand*", literally "standing against" (Heidegger, 1967, 140)

Experimental

> "The difference between natural and against nature, i.e., forced, is also eliminated [in modern science]; the violence, is as force only a measure of the change of motion and is no longer special in kind…Therefore, the concept of nature in general changes." –Martin Heidegger (1967)

Though the essence of modernity is the mathematical, the experiment is conceptually closely related and is crucial in this shift towards the loss of things. As described above, rather than being a product of observation and experience, the experimental method is a mathematical idealism insofar as it projects a priori conceptions onto nature (Glazebrook, 2000). Most importantly for my purposes, however, the experiment is an observation through active intervention: "The experiment is an active laying hold of its object through intervention rather than a passive, in the sense of non-interventionist, observing of how things behave when left to themselves" (Glazebrook, 2000, 95).

Galileo is once again key in this shift. His methodology "abolishes [the] opposition between nature and technology" insofar as the experiment, even though set up within technical conditions, is not considered forcing nature or contrivance, but rather a "cleaner, purer picture of nature" (Böhme, 2012, 156). Technology, likewise, can now be construed as "realizing what the laws of nature make possible no less fully than external nature itself," thus itself a kind of nature (Böhme, 2012, 157).

This technological aspect of modern scientific observation helps to define the boundaries and oppositions between the scientific approaches of Adolph Murie and the Craigheads and their requisite stances towards technology in field work and ecological management. The Craigheads' methods are not "experimental" in the narrow sense of setting up a controlled setting in a literal laboratory, which would be less conducive to the study of something like animal migration patterns and population ecology, yet it more closely approaches this standard than Muries' in striving towards the paradigm of mathematical physics. The Craigheads' science seeks to make the study of wild places "'exact' by studying it objectively, that is, mathematically in the sense of modeling…objects and thereby availing of the

exactitude afforded and demanded by the homogeneous and uniform properties of all that is objectified" (Beattie, 2016, 156-7).

Important to note are that the Craigheads' technological approach is an active intervention, guided by an a priori projection, wherein invasive techniques and "gadgetry" are thus justified. This fits with Galileo's experimental approach:

> "the decisive factor in the modern experiment is…the way nature is projected such that it makes sense to adapt the conditions of observation through intervention. Accordingly, the modern experiment stands…in opposition to simple experience itself…the contrast is between hermeneutic openness and a predetermining preconception" (Glazebrook, 2000, 96).

Wildlife and wildlands science reduce places and populations to statistics and graphs—translating them into space and position and rendering them on a Cartesian grid. Telemetry and tracking are disembodied knowing (whether conducted by a fixed station, helicopter, or even on foot as it may be); telemetry data for instance can thus be understood as empirical as opposed to experiential.

Admittedly certain sciences, to include field sciences such as geology, may have a hermeneutic dimension, while even Murie did incorporate quantitative methods, but he blended them with qualitative and conducted his measurements without substantive intervention. More importantly however within Muries' science are the shades of a non-mathematical Goethian scientific approach, to which I will return in the next chapter.

Fractured Experience

"How could we ever explain! We operate only with things which do not exist, with lines, surfaces, bodies, atoms, divisible times, divisible spaces—how can explanation ever be possible when we first make everything a *conception*, our conception!" –Fredrich Nietzsche (1882)

In modernity, certain types of experience are dismissed as invalid. Not only accounts of the mythical or miraculous—"varieties of religious experience" in William James's sense—but also, and more relevant for my purposes, the richness of everyday encounter with things—direct, visceral,

qualitative experience. The rendering of reality by an asensual "disincarnated rationality" is unduly privileged in modern thinking—a dismissal of the fulness of embodied sensorial experience. The mathematical—the essence of modernity—has roots in the history of philosophy, especially evident in the long-standing distinction—both epistemological and valuative—between primary and secondary qualities, between supposedly mind-dependent and mind-independent qualities. We have been trained to not only believe that this is a meaningful distinction, but to see so-called secondary qualities as neither real nor reliable. In the prioritization of primary over secondary qualities, secondary qualities are devalued and deemed derivative. This prioritization is also reflected in the problematic dominance of physics as an explanatory paradigm.

The distinction can be thought of in a variety of other ways as well. Galileo drew a division based on aspects of the world that can be quantified versus those that cannot (Dean Robbins, 2006, 3). It can also be thought of as a distinction between qualities that emerge when we attend to the world as "a causally governed system" versus "a phenomenological experience" (Christensen, et. al., 84), each revealing themselves to "the disembodied intelligence of mathematical knowledge" or the "tactile and kinesthetic type of reasoning" respectively (Frodeman, 2003, 112). Tim Ingold offers a telling anecdote of the difficulties of working with Sami people in Lapland in order to integrate their experiences and stories with climate monitoring, which well captures this division[38]:

> Environmental scientists and local Sami people were talking about quite different things. In a nutshell, whereas the scientists were out to detect changes in climate, what mattered to local people were changes in the weather. Climate is an abstraction compounded from a number of variables (temperature, precipitation, air pressure, windspeed, etc.) that are isolated for purposes of measurement. Weather, by contrast, is about what it feels like to be warm or cold, drenched in rain, caught in a storm and so on. In short, climate is recorded, weather experienced (Ingold & Kurttila, 2016, 187).

[38] His distinction between weather and climate is useful, but contradicts the generally accepted scientific distinction, wherein both weather and climate are measured and are differentiated solely by timeframe.

Contra Descartes, Ingold insists that weather is perceived by a multitude of senses at once, with the whole body in fact, whereas climate is purely known via instrumentation.

The distinction between primary and secondary qualities derives initially from Democritus (Rönn, 2017). It was later a Renaissance distinction that Galileo, who believed the universe was written in numbers hidden from the senses, formalized (Ortín Nadal, 2019), and eventually taken up by philosophical heavyweights, including Rene Descartes, John Locke, and David Hume.

Descartes dismissed secondary qualities as neither "clear nor distinct," since qualities like color and taste can only be known by one sense at a time in supposed contrast to aspects like motion and shape, while "in many cases the grasp of the senses is very obscure and confused" (Descartes, 1897). As usually interpreted, Locke and Hume believed secondary qualities lead "us into an erroneous understanding of the world" particularly insofar as they are irrelevant for explaining the causal workings of the physical world (Lenz, 2019, 1)[39].

For Locke, secondary qualities are, by one crucial measure, insubstantial, because they would disappear if we had highly sharpened senses. In other words, secondary qualities are merely a product of our cognitive limits. To illustrate this, Locke imagines a human being with microscopical eyes. Such a person would inhabit a different world altogether, one dominated by primary qualities (including internal constitutions of things). Tellingly though, Locke notes that this person might have insight into the workings of a clock but would be unable to tell the time (Locke, 1995). Locke thus seems to realize that instrumental mediation destroys the fulness of our encounter with the world; secondary qualities, or at least our relationship with them, disappear with instrumental mediation.

By one interpretation, however, Locke understands secondary qualities as indispensable for their role in creating "a phenomenal world that is teleologically grounded" insofar as they suit our

[39] In an example that resonates with James Inhofe's infamous congressional floor presentation of a snowball as a refutation of climate change, Locke uses the snowball as his key example in demonstrating the fractured nature of the experiential world.

human purposes and needs in navigating our lived-in world—providing us with a "lifeworld" (Lenz, 2019 21). Despite this, however, Locke seems to identify primary qualities with the true essence of things. His interpretation is thus cohesive with the overriding modern impulse towards certainty and security. In modern thought, just as secondary qualities are rendered superfluous in naturalistic explanation, the world is stripped of *telos*: "there is a striking connection between the explanatory irrelevance of secondary qualities and the supposed explanatory irrelevance of teleology...like final causes, secondary qualities do nothing to explain the causal efficacy in the world" (Lenz, 2019, 4).

This impulse, even when tempered by an admission of the practical necessity of everyday experience, can nevertheless cause us to lose sight of our dependence on the world, and to ignore "the complex, the ambiguous and the paradoxical" (Christensen, 2008, 85). In contrast, I interpret Heidegger to be in part flipping this prioritization of primary over secondary qualities, while challenging the distinction itself: the mathematical is a priori and thus subjective—a "mathematical idealism" founded on the Cartesian cogito (Glazebrook, 2000, 9).

Andrew Feenberg offers a different sense of primary and secondary qualities in his critical sociological analysis of technology, which, though starting from a very different point of departure than the epistemological sense, converges at a nearly identical distinction. For Feenberg, primary qualities are the bare elements perceived as necessary for accomplishing a technical program, wherein "things are simplified, stripped of technically useless qualities" (2000, 306). Though Feenberg attributes this reduction to socio-economic forces rather than to Heidegger's historically situated metaphysics, he too attributes a place of central importance to mathematics (though not the mathematical per se): "Quantification is the most complete reduction to primary qualities. 'Secondary qualities' are what remains" (2000, 306). Feenberg even draws an explicit connection to Heidegger's critique of technology by noting that Heideggerian enframing is the "reduction of all of reality to such primary qualities" (2000, 307).

Hierarchies of Understanding

This valuative distinction between different aspects of experience (or what cannot be experienced) has led to a hierarchical understanding of science in which those sciences, particularly theoretical physics, which are less encumbered by everyday qualitative experience, are presumed more fundamental insofar as they have a greater explanatory value. They rest on the bottom as the foundational bedrock of an epistemological pyramid as the purest, hardest form of knowing.

In analytic philosophy, this is usually discussed as supervenience and reductionism in the context of explanatory priority. Reductionism postulates that the natural sciences are ultimately reducible, or supervenient, to physics. There are good reasons to doubt this linear dependent relationship of the sciences, however. It may be rather that "the sciences consist of a series of regional accounts of reality with no clear hierarchy ranking them (i.e., physics does not "ground" other sciences)" (Frodeman, 2003, 60). Nevertheless, the common view, whether explicitly stated or not, is that physics is the paradigmatic science (typically with chemistry a step removed) in its non-experiential mathematical and lawful exactitude. It is therefore significant that Heidegger identifies theoretical physics as the essence of technology.

Modern Ethics as Mathematical

It is worth reiterating here that Newtonian physics set the standard for explanation in the modern era, including for modern ethics. Modern ethics too can be understood as mathematical in two main respects: first, as projective in the Heideggerian sense; second, as algorithmic in its aspirations. As with epistemology, the schism between pre-modern Aristotelian and modern thought is roughly between a knowing that is derivative from experience and a prior certainty brought to bear on a contrived instance, whether the concrete construction of a laboratory experiment, or the abstract construction of a thought experiment.

Modern ethics begins "in advance" with the thinking self—the cogito—the same metaphysical grounding as the Newtonian projection. It is in this sense "self-grounding" (Heidegger, 1967). Though Heidegger does not address ethics directly, there is a consistency between his analysis of modern science and modern ethics when he identifies that the modern epoch entails a "binding with obligations which are self-imposed. In the mathematical project develops an obligation to principles demanded by the mathematical itself" (Beattie, 2016, 145).

This self-grounding ethical foundation is found particularly in Kantian ethics, which assumes a mathematical conception of freedom: "a binding with obligations which are self-imposed" (Heidegger, 1967, 96). Modern ethics is thus "uniquely self-contained with respect to its own structure…it is grounded in its own principles" (Beattie, 2016, 145), and in what can be assured about things, brought ahead of time to observation. Just as the epistemology of modern science begins with the assured, so too does modern ethics, whether this be, for instance, a common measure of pleasure, or rationally deduced, universally applicable, self-imposed laws. All this in marked contrast to alternative foundations of ethics (or epistemology) that are a substantive outcome of immersion in the lifeworld, what might appropriately be called wisdom.

Insofar as modern ethics seeks to find a common measure—homogenizing the diversity of the right just as modern science flattens the diversity of the real—or in simplifying the complexities of real situations to a set of rules, laws, or procedures, it is algorithmic in its aspirations, if not always in its execution. This critical outlook is shared by philosopher Edward Mooney, who characterizes the broadly analytic approach to ethics[40] as "an algorithm determining right action" (Mooney, 2009, 26).

An algorithm is a procedure expressed as a formal system—a simplification of reality to abstract rules. It may be thought of as a set of "logical and mathematical decisions that can be followed without

[40] Into which I would also include Kantian ethics, even though he might be considered a continental philosopher.

any interpretation," wherein the mathematical—what we can assure about things—is what can be translated into algorithms (Tomaz, 2017, 281; 283).

Carl Mitcham, in contrasting technology with techniques, notes that "technologies, on the other hand, are more tightly associated with the conscious articulation of rules and principles…At the core of technology there seems to be a desire to transform the heuristics of technique into algorithms of practice" (Mitcham, 1978, 252). It is here particularly that the technological nature of modern ethics is revealed. Just as "technology is a mode of relating to the real by means of algorithmic procedures, an algorithmic mode of relating to the real" (Tomaz, 2017, 273-4), so is it a mode of relating to the right.

Beyond Technics

In the reductive modern impulse toward mathematical exactitude, there is a kind of violence. Heidegger interprets Aristotle to hold a distinction between what is done according to the nature of a thing and "what goes against its nature, that is, what it would not do according to its own nature"—between natural necessity and violence (Glazebrook, 2000, 101). Modern thought, including Newtonian-Galilean physics, eliminates this distinction, thereby creating the conditions wherein technology can be understood as a fulfillment of nature. There is thus "an inherent tendency to violence in modern science" (Glazebrook, 2000, 101). Furthermore, in Heidegger's analysis, "modern science is violent in its demand that all beings can be accounted for in exactitude" (Glazebrook, 2000, 108). This violence thus expands beyond concrete interventions into nature to include the projective, representational essence of modern thinking.

At the end of *The Question Concerning Technology*, Heidegger turns towards poetics in the hopes of countering this violence toward things (and ultimately towards ourselves)—the "'hollowing out' of the inner significance of things" (Beattie, 2016, 99). Heidegger famously quotes the German poet Holderlin: "But where danger is, grows there the saving power also…poetically man dwells on this earth"

(Heidegger, 1977b). Heidegger's hope is that a new form of poetic revealing can grow in the midst of the technological epoch, moving beyond representational and projective thought.

In *The Thing*, Heidegger strives to offer an alternative ontological vision of a thing that is "self-sustained, something that stands on its own…that is self-supporting, or independent" (Heidegger, 1971e, 165). Relatedly, Heidegger shifts grammar towards verbs (as does Latour), for instance, from a hammer to hammering—a thing thinging. Heidegger specifically attempts to reformulate grammar to accommodate "verbal nouns" in order to place things in time and reconnect them to their surrounding context of action and use:

> Still, one can often find in Heidegger a kind of forced verbalisation, that is, unheard-of inflections and constructions of verbs and verbal nouns (nouns used as verbs). For instance, Heidegger often uses a constructed verbal form of the German noun Wesen ('essence'), so that das Wesen 'west' is almost untranslatable. Another example is Heidegger's distorted verbal form of the word 'thing' from his 1950 lecture, 'The Thing': 'The jug is a thing insofar as it things' (Heidegger, 1971, 175; Schiølin, 779).

This verbing of grammar shifts speech away from the "technization of all languages into a merely functional interplanetary instrument of information" (Heidegger, 1985a, 160) towards a reanimated language that defies objectification and the technical revealing of *Bestand*. This is sharply reminiscent of the verb-heavy oral grammar of many of the world's indigenous peoples—the "grammar of animacy" described by botanist and writer Robin Wall Kimmerer, who notes, as just one instance, that "only 30 percent of English words are verbs, but in Potawatomi that proportion is 70 percent," while in Ojibwe, the term for "hill" is "to be a hill" (Kimmerer, 2013, 55; 54). Julie Cruikshank likewise observes that "Both Athabaskan and Tlingit languages have comparatively fewer nouns but are verb-rich and hence often define landscapes in terms of action…Both languages emphasize activity and motion, making no distinction between animate and inanimate" (Cruikshank, 2014, 4).

Though Heidegger never uses the term, it seems that he is after a conception of wildness[41]. It is thus here that Heidegger's critiques create an opening for the emergence of a wild ethic in the context of ubiquitous technology and the specter of technocracy. This is possible partly through a turn toward poetics. Just as technology is far more than machinery and material devices, so too is poetics far more than poetry. It is rather a form of interactional attunement to the world, capable of restructuring language, thinking, and environmental management.

Before providing an in-depth look at poetics in Chapter 5, however, I will trace out a genealogy of thought stretching back at least as far as Goethe in the early 19th century—the poetic lineage of the Muries in distinction to the technical lineage I have just presented of the Craigheads. Goethe and those he influenced actively attempted to both resist, and formulate alternatives to, the emergence of many of the aspects of modern science just described, including the central role it plays in modern thought. Heidegger's critique of scientific objectivity, and subsequent de-thinging of the world, as the basis for his critique of technology has roots in a history of romantic thought, broadly conceived, found in Goethe, Rousseau[42], and others. I turn to this lineage in the next chapter.

[41] Holderlin does however include "holy wildness" or "holy wilderness" (*heilige Wildnis*) in one of his poems (Kleinberg-Levin, 2005, 412)

[42] Though Rousseau's political-ethical theory may itself be mathematical in Heidegger's sense (Beattie, 2016).

Chapter Four: The Poetics of Knowing – The Goethean Ideal and Other Alternatives to Technological Science

"The Romantic imperative demands the mixing of all genres. All nature and science should become art—[and all] art should become nature and science. Imperative: Poetry should become ethical and ethics should become poetic." –Friedrich Schlegel (1798)

In the 2017 film *Chasing Coral* a group of scientists, filmmakers, and photographers set off to document a coral bleaching event with the intent to make a hidden event emotionally visceral for a wide audience. They designed sophisticated, custom-built machines that could record continuously in extreme underwater conditions. These machines failed. Instead, the crew needed to revisit the sites each day and manually take repeat photographs. This forced them to witness firsthand day after day the slow death of an ecosystem. The effects of this are clearly devastating on the crew. One member consciously reflects on the implications of this methodological shift:

> We designed something originally to do this project without emotions and when we began doing this manually at Lizard Island you have the emotional ties to it. You are down there. And to sit there for a month and every single day watch something new around you die that you saw yesterday. It's just difficult. You forget what it looks like in the beginning. And some days when you go back and you're sitting down there looking at it now, it doesn't look real...and you can't even accept it. And then you open your eyes and it's dead as far as you can see (*Chasing Coral*).

This example hints towards the moral limits of the utopian ideal of technological ecosystem management by a disincarnated rationality as described in Chapter 3[43].

From a technocratic perspective, such first-hand accounts and resonant human connections with place are easily dismissed. In Chapter 2, I outlined several examples of environmental conflicts between technocrats representing the technical aspect of knowing and managing, and literary activists,

[43] Again: An extreme form of this de-worlding might be the utopian ideal of "a system of perfect computer-guided ecomanagement" (Böhme, 2012, 20). This expression of technical utopia finds a likeness in the possibilities of science as the basis for ecological management: imagine a series of computer-guided drones and stationary automated ecological monitoring stations, piping information to a computer equipped with AI software, which compiles all these measures, integrates them into models, and perhaps even provides suggestions for management decisions—a fully disembodied management system.

representing the poetic: Gifford Pinchot vs John Muir, Floyd Dominy vs David Brower, and Earl Butz vs Wendell Berry. In each case, the State sees poetics as "fluff"—subjective, flowery, impractical, and thus insignificant and ignorable. The logical endpoint of seeing poetics as fluff culminates in the grandiose goals of each of these technocrats, whether a series of mega-dams across the entire Colorado River watershed, to monitoring grizzlies with enemy surveillance technology, to maximizing agricultural efficiency at the expense of small farmers and cultural continuity.

Tactile, visceral ways of knowing nature—the sort of knowing that resists propositional formulation[44]—is also easily dismissible as merely anecdote or a "hand-waving argument" (defined in one instance as an argument "that is based not on solid data or calculations but on an extensive and often poetic description" [Bowen, 2005, 284]). In one way, this is understandable, as in the case of a "cowboy" approach towards facts, exemplified by U.S. senator James Inhofe's presentation of a single snowball as evidence against climate change. This is the kind of ignorant, anti-scientific stance that is rightfully dismissed and thus seems to justify suspicion of personal experience.

There are however examples that occupy a middle ground. A case study of a long-standing effort to combat pollution in Chesapeake Bay reveals the limitations of models as compared to local knowledge and direct experience. In this case, immense amounts of time and funding went into creating a 3D model of the bay. Yet, despite the "seductive appeal" of models due to their "clear numerical results with which to gauge progress," they are only as good as their inputs, which are likely never to be complete; furthermore, "the more complex the model, the less accurate it becomes" (Layzer, 2015, 123). In this case, not only did on-the-ground scientific monitoring and local observation reveal discrepancies, thus exposing epistemological shortcomings, but the moral shortcomings of technological mediation are also evident. After walking a few steps into a major tributary of the bay, local senator

[44] See Mooney, 2009, 172

Bernie Fowler noticed how murky the water was, revealed in part by how poorly he could see his shoes as compared to his memories, prompting him to commit to greater action and to comment:

> When people like me grow old and die off, we risk leaving a whole generation that has no idea what this river really was. No memory banks in those computers at EPA can recall…the thrill of the oyster fleet coming in at sunset, the shuckers in the oyster house all singing harmony while they worked. If we can't make some headway soon, these children will never have the hope and the dream of bringing the water back, because they just won't have any idea how enriching it used to be (Layzer, 2015, 123).

Thus, while on the one hand, there is an epistemological and moral necessity for direct acquaintance to inform decision making and policy—to both ensure accuracy and inoculate against the risk of giving too much over to the technical—on the other, there is the risk of antiscientific dogma.

Acknowledging the flaws of, and seeking to move beyond, modern science does not thereby permit free reign in "getting anything we want," to include climate change denial, flat earth cosmography, or special creation, among others; nor do concerns about rigor in science and guarding against pseudoscience justify dismissing challenges to modern science and thereby giving way to a destructive reductionism. It is the difficulty of walking this line and operating within this tension that I propose to navigate by offering poetics.

In the following, I will be questioning concerning scientific practices. It is commonly assumed that scientific practices are neutral: a selected method is simply the best way to gain knowledge about some aspect of the world. Science, it is thought, is a methodical form of inquiry whose aim is systematic knowledge production, with little relation to the feeling, embodied self. This is epitomized perhaps in remote sensing and related technologically mediated scientific practices.

On the other hand, some philosophers and social scientists have pointed to scientific practices as manipulating or distancing us from the natural world, which is presumably the object of study of the natural sciences. These critics have drawn attention to the often-detached objectivity of science as a flawed ethos that grounds scientific practices, particularly insofar as it lacks a substantive, intimate relationship with place and local ecologies, thus contributing toward environmental degradation. In

other words, the nature of scientific practices has moral implications: how we know and engage with the world affects our sense of what the world is and how we think we ought to treat it.

I have in the previous chapter provided a description of the uniqueness of modernity insofar as it is modeled after modern science and is thus mathematical in Heidegger's sense of being projective and representative. Mapping out the landscape of modernity and technics traces one half of the lineage of thought and practice that laid the foundations for the conflict between the Craigheads and Muries, as described in Chapter 2.

This chapter begins to consider the second half by focusing on the complex relationships between place, embodiment, knowledge, and ethics, particularly the tension between the detached stance of objective science and the intimate, transformative encounters with place and landscape so integral to some other forms of science and varieties of knowing, such as indigenous knowledge or those founded on narrative or lyric. In this chapter I begin to present alternatives to modern science, and thus modern thought, by taking a historical look at the development of forms of poetic inquiry, particularly those that emerged as deliberate responses to the emergence of modern science, by considering the work and lives of hybrid-scientists like Alexander von Humboldt, H.D. Thoreau, and Goethe on the way toward an ethic of encounter and scientific practice—a wild ethic.

Prior to the emergence of modern science, the moral, aesthetic, and scientific spheres were more united. A historical consideration of the context of this development is crucial for understanding renewed possibilities for a reunited approach to comprehending and managing nature. I will begin this historical consideration with Henry David Thoreau in order to investigate the moral and historical dimensions of scientific practices as an important corrective to scientific and technological mediation. First however I will return to a differentiation I laid out in Chapter 2 between ways of knowing in the context of environmental management.

Ways of Knowing-Managing

In the last chapter (Chapter 3), I detailed technics—one of four ways of apprehending, and thus ultimately managing, nature—alongside cowboy biology, poetics, and traditional ecological knowledge. The contours of these four ways were revealed in Chapter 2 during a consideration of two case studies focused on wildlands management and glaciers. In the following chapter (5) I will treat poetics at the same level of depth I previously gave technics.

Technics, in an epistemological context, is exemplified by modern science while poetics is exemplified by the myriad of alternative, usually neglected, traditions developed in response to and alongside modern science, often associated with some variant of romanticism. These four ways of knowing-managing, however, particularly technics and poetics, are broad outlines. I have unearthed many variants within a diverse body of academic literature, especially under the umbrella of poetics (or conscious attempts at integrating technics with poetics), which I have included in this chart. Below is a highly abbreviated version. I have included the full chart at the end of this dissertation as Appendix B.

Table 1: Ways of Knowing-Managing

Type	Definition	Who	Example(s)
Modern Science	Modern science, coupled with modern technology, is the basis for how nature is known, surveilled, and managed, exemplified in the case of the Craigheads' application of Cold War technology to Yellowstone area grizzly bears and other wildlife. Heidegger identifies the essence of modern science (and thus technology) with an a priori projection of the mathematical.	Predominant; many, especially Newton and Galileo	Craigheads' wildlife biology, U.S. Army Corps of Engineer's Project Iceworm
Post-Modern Science	Environmental ethicist J. Baird Callicot attempted to formulate "an environmental ethic grounded in a postmodern scientific worldview" (Callicot, 1997, 197).	Callicot, Zimmerman	
Pre-modern Science (Aristotelian)	Heidegger identifies pre-modern Aristotelian science as experiential in contrast to empirical (experimental) modern science. Heidegger characterizes Aristotelian science as operating according to a model "in which the phenomena themselves are the basis for generalization" (Glazebrook, 2000, 95).	Aristotle	
Natural Philosophy	Closely related to Aristotelian pre-modern science, natural philosophy is both precursor to modern science and substantively distinguished from it in several respects. One commentator has noted that natural philosophy, in distinction to modern science, tried "to express the essential qualities of nature by ways [sic] of qualitative studies" (Christensen, et. al., 2008, 4).		
Personal Knowledge (also Professional Judgement and Informed Intuition)	*Personal knowledge and professional judgement* acknowledge "the fundamentally interpretive nature of [scientist's] research": "Adjusting for constantly changing conditions requires a nuanced sense of one's work, what the biologist Michael Polanyi calls 'personal knowledge.'" (Frodeman, 2003, 35).	Michael Polanyi	Architecture

Cowboy Biology	The basis for scientifically uninformed and commodified management of nature, based on a tourist-centered vision, exemplified by National Park Service management in Yellowstone and Yosemite prior to the 1970s. This might be considered a "shallow aesthetics."	James Inhofe	60s era Yellowstone NP
Barstool Biology	A form of personal, local knowledge referenced positively by applied ecologist Fikret Berkes (in the larger context of Traditional Ecological Knowledge): "Often dismissed as 'barstool biology', the ecological knowledges of local hunters in the northern Yellowstone ecosystem are rooted in environmental experience and situated politics" [Robbins, 2006, 185).	Yellowstone area local hunters	
Shoe-leather Study	A term used in a variety of disciplines to refer to a form of study necessitating embodied engagement—particularly walking—as opposed to armchair conjecture or technological data collection.	Adolph and Olaus Murie	Ecology, epidemiology, ornithology, statistics
Holistic Science	The most relevant meaning of holistic science is formulated by ecologist Stephen Harding: "Holistic science concerns itself with the rigorous and integrated deployment of the full capacities of the human psyche in order to develop a deeply and truly participative relationship with nature. In this respect it differs from mainstream science, which believes that we can gain reliable knowledge of the world only through analytical mathematical reasoning in order to one day achieve the ideal of complete dominance and control of nature" (Harding, 2011, 1).	Stephen Harding, David Bohm	Holistic landscape ecology
Experiential Science (also Participatory Science and Experiential Knowledge)	In academic literature, "experiential science" has been referred to in the context of Traditional Ecological Knowledge of glacier ice in Alaska (Cruikshank, 2014, 32), and in the context of organic farming in *Experiential science as a novel scientific discipline* (Baars & Wagenaar, 2002).		Conservation, Fisheries,
Qualitative Science	"in reality, there can be no science that is not qualitative; mere quantity does not give us any material content. Without qualities we have no world to try to understand. And if we must deal with qualities, then it's far better to be aware of what we're doing than to smuggle those qualities into our work in an undisciplined fashion while pretending we have nothing to do with them" (Talbott, From Mechanism to a Science of Qualities).	Stephen L. Talbott	Molecular Biology / Genetics
Poetic Science	A form of science that includes a poetic dimension wherein nature is known by embodied, sensual encounter, exemplified in the case of the Muries' naturalist science and associated vision of wilderness without deliberate human interference. Its usage spans a wide variety of disciplines.	H.D. Thoreau, Aldo Leopold,	Geopoetics, Transcendental Ecology, Medicine, Psychology
Romantic Science	Inspired by "the spirit of late 18th-century and early-19th century German romanticism," contemporary romantic science is a deliberately unorthodox "counter-tradition to 'normal science'" (Halliwell, 2016, 255) with strong ties to phenomenology in the tradition of William James's "radical empiricism." Romantic science works against the modern tendency to strictly divide disciplines, particularly art and empirical science. Instead, self and world, aesthetic and technical understanding, are all valuable assets in knowing the natural world (Meinhardt, 2019, 225).	Alexander von Humboldt, Oliver Sacks, H.D. Thoreau, Goethe, Otto Rank	Medicine (Neurology), Geography, Natural History
Literary Science	*Literary Science* is referred to positively in *John Muir's Literary Science*: "In his determined amateurism and refusal to limit himself to the discourse of the professionals, Muir reached a wider audience with greater effect, gaining for himself a place not only in scientific, but also in literary history" (Gifford, 2011).	John Muir	Conservation
Sympathy with Intelligence	*Sympathy with Intelligence* was coined by Thoreau in his essay *Walking*: "The highest that we can attain to is not Knowledge, but Sympathy with Intelligence" (1862, 86).	Thoreau	
Traditional Ecological Knowledge (AKA Sacred Ecology, Indigenous Knowledge, Indigenous	*Traditional Ecological Knowledge (TEK)* is a broad and encompassing term that includes both the bodies of knowledge and ways of knowing nature held by indigenous peoples, and others with similar, long-standing relationships to specific places, gained by close, prolonged interactions with local environments, and including substantive components that are handed down across generations. Associated concepts include local, indigenous, or experiential knowledge.	Found in the great diversity of indigenous traditions throughout the world, and analyzed philosophically by	Many

Science, Ethnoscience, Folk Science)		thinkers like David Abram.	
Integral Ecology	Integral Ecology is a self-described meta-theory that provides an overarching framework in which to integrate multiple perspectives into environmental decision making. It is based on the theory that a multitude of ways of knowing are necessary to effectively understand and manage the environment. Of note is its inclusion of subjective and inter-subjective perspectives, to include first-hand experience and culture, respectively, as well as its attention to non-human interiority. Integral ecology recognizes the problematic nature of modernity in severing art, morals, and science into separate realms of I, We, and It, and seeks to reunify them (Esbjorn-Hargens & Zimmerman, 2011, 22).	Esbjorn-Hargens & Zimmerman Wilber	Conservation, Fishery Management, Sustainable Community Development
Post-normal Science	Stemming from Thomas Kuhn's term, post-normal science, as originally formulated, is the product of a new scientific method, neither value-free nor ethically neutral, applied to complex public problems (Funtowicz & Ravetz, 1990, 22).	Funtowicz & Ravetz	Fisheries, Public Health, Climate Change
Wild Science	See appendix	Marchessault & Sawchuk	Medicine, GIS

Uncovering a Poetic Lineage

"The physics of beauty is one department of natural science still in the Dark Ages. Not even the manipulators of bent space have tried to solve its equations." –Aldo Leopold (1949)

I trace out here the lineage of thought and practice that led to the Muries' approach to the study of nature and their requisite environmental ethics by examining the three historic approaches towards scientific practice: H.D. Thoreau's, Alexander von Humboldt's, and Goethe's. Each responded to an emerging modern science by deliberately refining and integrating experience into their methods.

Surveying Nature

"The question is not what you look at, but how you look and whether you see."
–H.D. Thoreau (Journal, 8/5/1851)

Thoreau was many things. He is best known as a writer, nature-lover, and political essayist. He has also been called "a philosopher of the senses" (Mooney, 2009, 195), who wrote perhaps the world's first philosophical treatment of walking. Less known is that he was not only a literary figure and philosopher, but also a professional surveyor and amateur scientist in the vein of 19th-century natural

historians: his descriptive contributions to ecology and anthropology are still used today[45]. His thinking and practice developed toward naturalistic and scientific description in his later life; nevertheless, Thoreau continued to contemplate the relationship of epistemology and environmental ethics.

Like Goethe and Alexander von Humboldt, Thoreau wrote at a time when disciplinary boundaries were less defined, but in the process of quickly severing apart, due especially to professionalization and specialization (Kuhn, 2009, 1). These forces have led to some obvious benefits, but also great costs. As such, each of these figures, along with relative contemporaries like Rousseau and Nietzsche, deliberately grabble with the emergence of modern science as a dominant way of understanding nature—independent of moral and aesthetic concerns—and how it differs from embodied, humanistic forms of inquiry.

Thoreau was a careful, thorough, quantitative, and skeptical surveyor. This is especially evident in his essay *Cape Cod*. During his travels through the region, he calculated, in combination with the prior efforts of surveyors and local first-hand accounts, the erosion rates of the shoreline in the vicinity of a lighthouse (which he concluded was about forty feet between October and June 1855) and made projections about future shore loss to erosion. Yet he was skeptical of his own conclusions: "Any conclusion drawn from the observations of a few years or one generation only are likely to prove false" (Thoreau, 1865).

Thoreau was skeptical of more than the conclusions of his scientific measurement, however, to include the limitations of science itself. Portending remote sensing and modeling, Thoreau warns against the scientist who would "survey the world through a telescope or a microscope, and never with his natural eye" (1854, 49). In *Walden*, he offers multiple accounts of his own surveys of the now famous pond. In the first, he begins with a proper geographic overview of the area[46]. He then proceeds to give a

[45] See Primack (2014) for instance.

[46] "It is a clear and deep green well, half a mile long and a mile and three quarters in circumference, and contains about sixty-one and a half acres; a perennial spring in the midst of pine and oak woods, without any visible inlet or

prolonged and extremely detailed "survey" of the immense variety of coloration of the pond over time[47]. Later in *Walden*, he surveys the depths of the pond mathematically and precisely[48]. He then applies this mathematical formula to nearby White Pond, finding similar results, causing him to speculate on the nature of natural laws in relation to specific entities and places in the world.

For Thoreau, this tension between science and a broader sense of the universe and our place in it was a lifelong struggle: "I fear that the character of my knowledge is from year to year becoming more distinct and scientific; that, in exchange for views as wide as heaven's cope, I am being narrowed down to the field of the microscope" (Journal, 8/19/1851). And he reflects elsewhere that "[I]n my account of this bream I cannot go a hair's breadth beyond the…miracle of its existence…I only see the bream in its orbit, as I see a star, but I care not to measure its distance or weight" (Journal, 11/30/1858).

Thoreau is perhaps most explicit about his vision for how science should be conducted in his 1842 essay, *Natural History of Massachusetts*. The State of Massachusetts funded a scientific survey, whose results were published as *The Reports on Fishes, Reptiles, Insects, and Invertebrate Animals*. Thoreau read and commented on *The Reports*. While he celebrates the survey, he also uses the opportunity to criticize the fruits of their labor—the surveyors amass many facts but miss "facts of importance":

> These volumes deal much in measurements and minute descriptions…[However], wisdom does not inspect, but behold. We must look a long time before we can see…The true man of science will know nature better by his finer organization; he will smell, taste, see, hear, feel, better than other men. His will be a deeper and finer experience. *We do not learn by inference and*

outlet except by the clouds and evaporation. The surrounding hills rise abruptly from the water to the height of forty to eighty feet, though on the south-east and east they attain to about one hundred and one hundred and fifty feet respectively, within a quarter and a third of a mile. They are exclusively woodland" (1854, 170).

[47] "Walden is blue at one time and green at another, even from the same point of view. Lying between the earth and the heavens, it partakes of the color of both. Viewed from a hill-top it reflects the color of the sky; but near at hand it is of a yellowish tint next the shore where you can see the sand, then a light green, which gradually deepens to a uniform dark green in the body of the pond. In some lights, viewed even from a hill-top, it is of a vivid green next the shore" (1854, 171).

[48] "I fathomed it easily with a cod-line and a stone weighing about a pound and a half…The greatest depth was exactly one hundred and two feet; to which may be added the five feet which it has risen since, making one hundred and seven…I laid a rule on the map lengthwise, and then breadthwise, and found, to my surprise, that the line of greatest length intersected the line of greatest breadth *exactly* at the point of greatest depth" (1854, 280).

> *deduction, and the application of mathematics to philosophy, but by direct intercourse and sympathy. It is with science as with ethics, we cannot know truth by contrivance and method*; the Baconian is as false as any other, and with all the helps of machinery and the arts, the most scientific will still be the healthiest and friendliest man, and possess a more perfect Indian wisdom (1842, 24, emphasis added).

It is not enough then to simply inspect, to apply mathematics or method; rather, the scientist (and ethicist) must behold, perfect sensual attunement, spend time bathed in the qualitative aspects revealed by the natural eye, and ultimately attain Sympathy with Intelligence—a healthy antidote to Cartesian detachment or Baconian domination. Thoreau strikes a similar theme in his more well-known essay, *Walking, or the Wild*:

> My desire for knowledge is intermittent, but my desire to bathe my head in atmospheres unknown to my feet is perennial and constant. *The highest that we can attain to is not Knowledge, but Sympathy with Intelligence*. I do not know that this higher knowledge amounts to anything more definite than a novel and grand surprise on a sudden revelation of the insufficiency of all that we called Knowledge before—a discovery that there are more things in heaven and earth than are dreamed of in our philosophy (1862, 86, emphasis added).

Thoreau thus sought to merge the scientific and the poetic—the latter dependent upon embodied engagement, epitomized by walking. A scientific practice that incorporates walking, however, is alone insufficient. The surveyors who merely "inspected" Massachusetts' flora and fauna spent ample time on foot; and, inverting Thoreau's prior concern about detachment resulting from surveying the world only remotely, it is possible to at times be similarly detached while walking. Due to our thoughts, we may at times identify with Thoreau's sentiment that "I am not where my body is—I am out of my senses" (1862, 64). Sympathy with Intelligence takes will and time to cultivate[49].

It is far too easy to lose the poetic particulars of place, drowned in the search for general principles, and especially mathematical laws. Detached mathematical survey has privilege of place over the poetic, the processual—the fruits of long acquaintance with a place or the deliberate beholding of

[49] Or again: "A man may walk abroad and no more see the sky than if he walked under a shed. The poet is more in the air than the naturalist, though they may walk side by side. Granted that you are out of doors; but what if the outer door *is* open, if the inner door is shut!" (Journal, 8/21/1851).

things. Thoreau draws our attention to this, but he does not stop here—specific places and moments provoke reveries[50] that take him into moral and cosmological ground. Here, on the other side of modernist and positivist purgings of science, this sort of movement may seem unacceptable.

Thoreau's willingness to merge disparate approaches and forms of truth is expressed in several ways. He blends moral and scientific truth, such that "the life the scientist leads is itself an expression of the very truth he seeks" (Kuhn, 2009, 128). He likewise draws attention to the "pre-theoretical…poetic attachments or alienations" of scientists—the poetic side of science, including mood and attunement, not captured by technical papers (Mooney, 2015, 10).

Many of these same themes are found in the work of Alexander von Humboldt, who, like Thoreau, struggled with the tension between Enlightenment and Romanticism. For Humboldt, as for Thoreau, and many of the world's indigenous peoples, nature, and the experience of it, is a moral force.

Feeling What You Measure

"A feeling of melancholy, or solemnity, or of light buoyant animation is in turn awakened by the contemplation of our native trees. This influence of the physical on the moral world—this mysterious reaction of the sensuous on the ideal, gives to the study of nature, when considered from a higher point of view, a peculiar charm which has not hitherto been sufficiently recognized."
–Alexander von Humboldt (1850)

Alexander Von Humboldt—the famous nineteenth-century scientist-explorer, widely credited with first conceptualizing the possibility of human-induced climate change—similarly struggled with the controlling detachment implicit in an emerging modern science, in contrast to the living presence of the natural world. Humboldt, like Thoreau, insisted on the importance of direct observation and was, significantly more than Thoreau, a careful, quantitative scientist. Like Thoreau, Humboldt's work was also more akin to natural history than what at the time may have been called natural philosophy.

[50] "thoughts halfway between philosophy and poetry, halfway between factual reports and imaginative constructions, halfway between what is and what would be" (Mooney, 2015, 4).

Geographer Bernard Debarbieux, in his essay *Mountains: Between Pure Reason and Embodied Experience*, provides a compelling account of a rivalry between 18th-century geographer Phillipe Buache and Humboldt (2009). Buache was a leading speculative (or rational) geographer who believed that landscape features could be known a priori according to rational speculation rather than empirical investigation. Humboldt mocked Buache's armchair method to knowing the world. While Buache's approach differs greatly from remote sensing or modeling, each of which are fundamentally empirical, both it and that of contemporary forms of remote technological measurement share an inherent distancing from their subject along with its requisite moral implications.

In seeking a "holistic view of nature," Humboldt incorporated a deliberate practice of alternating between measurement and "unmediated sense observation" (Debarbieux, 2009, 101; 100). His two-fold approach consisted of "a preliminary sensual abandonment to the grandeur of nature, followed by the careful observation of landscape physiogramy and the 'rational' investigation of physical laws" (Debarbieux, 2009, 120). He sought to experience, not just record and measure, the entirety of the landscape, as he comparatively considered his prior experiences and measurements. For Humboldt, "the capacity of vision to react to the environment in situ counts for much more" than the systematic study of maps, charts, and information favored by Buache (Debarbieux, 2009, 102). Working in the field was not only an epistemological necessity, but by opening himself this way Humboldt was able to perceive the world's living presence, enabling him to reflect that,

> In the forests of the Amazon, as on the slopes of the Andes, I felt that the surface of the Earth was alive everywhere with the same spirit, the life even which is in the rocks, the plants and the animals, as in the heart of humanity from one pole to the other. Everywhere I went I realised just how much…inspired by Goethe's reflections of Nature, I had gained new organs of perception (1806).

"I felt," says Humboldt. Maren Meinhardt, in her biography of Humboldt, describes his reliance on his emotions and requisite embodied response thus:

> the essence of a natural phenomenon could be grasped in its truest form through an emotional response. For this, it was necessary to go beyond the purely quantitative, the mere collecting of

> data, and gain what [Humboldt] called a 'total impression'…The turn to the interior also meant that the most objective criterion was, eventually, found in the most subjective one: what Humboldt's own senses told him (Meinhardt, 2019, 4).

Crucial to Humboldt's science was his emotional response to his sensual encounters[51]. Taken together, this form of scientific investigation includes a sense that nature is a subject, capable of inducing individual transformation.

The romantic tradition, broadly conceived to include Humboldt, Thoreau, and Goethe, owes much to Rousseau, who, even as he insisted that science and society corrupt rather than benefit people, was himself a scientist who contributed to several disciplines, especially botany, and was well-regarded by scientists of his day (Kuhn, 2009, 26). Rousseau simply recognized the fragmentation of disciplines and the degree of human alienation from the natural world before most others. As noted in the third Chapter, Rousseau anticipated some of Heidegger's later insights by identifying how in pharmacology, "the plant itself, as a living organic structure, becomes invisible" (Kuhn, 2009, 27).

This relation is more than cursory. Edward Mooney has even referred to Continental Philosophy as a "continuation of German Romanticism" (Mooney, 2009, 116). There were also deep ties between the thinkers of 19th century New England, such as Thoreau and Emerson, and Germany, solidified in part by ample institutional exchange of scholars and continuous translation of works back and forth (Kuhn, 2009, 116). Each region nevertheless had its own flavor and emphasis (Fischer & Nassar, 2015, 8). As noted in Chapter 2, however, romanticism is often unduly dismissed:

> When in social criticism and theory a position is called romantic, the appellation is often thought to be tantamount to a refutation—romanticism is hopeless and regressive if not reactionary…Yet it remains that no one has been able to answer the romantic complaint that there is more to the world than a mechanical universe and a mercenary world (Borgmann, 2006, 7-8).

[51] Or as English professor Bernard Kuhn puts it: "For Romantic natural historians such as Alexander Von Humboldt, reason is simply not enough…painstaking observation [must] be supplemented by the emotional responses, subjective impressions, aesthetic judgement, intuitive insight, and informed imagination of the observer" blended seamlessly together (Kuhn, 2009, 15).

Romanticism is better understood as a productive response to both the flaws and overreach of the Enlightenment—giving proper place to human passions and the world we actually experience and navigate on a daily basis (and the grandeur that persists at the limit of human experience)—and a response to select elements of an emerging industrial economy. Key romantic contributions include "the aesthetic-epistemic principle of the complementarity of the poetic and scientific conceptions of nature" as "a fundamental organizing conception in the philosophy of the early Romantics" (Richards, 2006, 28) and "the interdependent complementarity of Kantian lawfulness and Goethean presence" (Borgmann, 2006, 34).

It is also worth mentioning the prominence of botany and biology in romantic thought as opposed to physics, upending a certain hierarchical understanding of science. As I previously noted, in the conventional (modern) view, physics is the epitome of science and explanation in general—a "hard" science that sits at the foundation of all others. Kant dismissed biology as a philosophically relevant field of inquiry, but Schelling and other romantic philosophers elevated its status (Meinhardt, 2015, 225; Kuhn, 2009, 4+7). This reevaluation is still reflected in the oft repeated contrast of conceptualizing nature as mechanism versus organism.

This organismic sense of nature as deliberate contrast to and critique of the mechanistic is found in other contexts as well. One of the preeminent texts on traditional ecological knowledge, *Sacred Ecology*, draws a direct parallel between its namesake term, "sacred", and the injection of "some life-force into the machine-like scientific conceptualizations of ecosystems" (Berkes, 2018, 12). In perhaps the most well-known treatment of indigenous knowledge, Robin Kimmerer's *Braiding Sweetgrass*, she similarly contrasts "the language of mechanism and objectification" with traditional knowledge and "the language of plants" (Kimmerer, 2013, 165). Not insignificantly, Kimmerer is a botanist and thus her analysis of science, like Goethe's and Rousseau's, flows from this subdiscipline.

Kimmerer reframes an experiment as "a kind of conversation with plants" (Kimmerer, 2013, 158). While this is an important insight, it problematically blurs distinctions between the experimental and experiential. Other prominent experts on traditional ecological knowledge have argued that there really is no substantive difference between indigenous knowledge and science (Agrawal, 1995; Whyte, 2013, 7). This may be true if a larger perspective is taken on science to include the subvariants identified above, particularly those spawned by the romantic tradition. However, these thinkers fail to fully recognize the mathematical and experimental essence of modern science identified by Heidegger. This is no small oversight with implications for their adjacent affirmation of a holistic knowledge held by indigenous peoples that includes a layer of morals and ethics necessarily embedded in these ways of knowing (Berkes, 2018, 12; Whyte, 2013, 6). I will however return to indigenous knowledge in Chapter 6.

By certain accounts, the Enlightenment arrived later and thus perhaps did not seep as deeply into Germany as it did in France and England, hence Germany's disproportionate role in romanticism[52]. More speculatively, some of romanticism's key insights may have deeper roots in pre-Christian, indigenous European traditions that survived as an echo beneath the waves of Christian and Enlightenment thought that washed over Europe for millennia. In any case, there are clear connections between Continental philosophy, romanticism, and many indigenous traditions[53].

It should not be surprising therefore that Rousseau's solution to the "enframing" that makes plants invisible is also not unlike Heidegger's. Rousseau attempts to focus on the sensuous presence of things, in this case the structure of plants, as a middle way between a teleological and modern scientific

[52] "Prominent scholars of a previous generation, such as Reinhart Koselleck and Jürgen Habermas, tended to view the Enlightenment in Germany as a relatively late phenomenon, tame and apolitical in comparison to other parts of Europe" (The German Enlightenment).

[53] Julie Cruikshank makes this connection: "Different though they may at first seem from Tlingit ideas, conceptualizations of nature in Europe at the very time that scientific expeditions were setting out were in some ways similar…Anthropologist Elizabeth Povinelli traces how conceptions of sentience persisting from Medieval Europe were suppressed during subsequent centuries. A 'country that listens' had to be rejected as concerns about manufacturing and imperialism took hold" (Cruikshank, 2014, 142-3).

view, both of which miss the sensuous and poetic: "The former would inevitably look beyond the object to God or any other transcendent principle, while the latter would look through the object to the useful properties and compounds that comprise the plant" (Kuhn, 2009, 61).

The developments identified by Rousseau (fragmentation and alienation) were also recognized by Goethe. Thoreau and Humboldt actualize the "Goethean Ideal" of science, which attempts to unite methodology with knowledge, emotions, and mind (Debarbieux, 2009, 104). However, importantly, Thoreau and Humboldt both break free from Goethe's distinct approach, modifying and expanding it for their own purposes, moving well beyond the genteel European environs in which Goethe was situated to a more immersive encounter with nature in a wide diversity of largely untamed North and South American landscapes. Thoreau in particular "radically expands and democratizes Goethe's approach to nature and to the self" (Kuhn, 2009, 115). I will thus return to Thoreau in Chapter 7 when I lay the groundwork for a wild ethic.

The Goethean Ideal

> "How difficult it is, though, to refrain from replacing the thing with its sign, to keep the object alive before us instead of killing it with the word…things we might call activities rather than objects."
> –Wolfgang von Goethe (1810, 12: 277)

Though known mainly for his literary contributions, polymath Wolfgang von Goethe was a profoundly influential thinker in his own right. Thoreau and Humboldt (as well as 20th century philosophers Heidegger[54] and Wittgenstein[55], sociologist Max Weber[56], and many others) were all

[54] Heidegger "cites Goethe commenting on the way the new physics in Goethe's time reduces knowledge of nature to what artificial instruments indicate [zeigen]" (Ma & Van Brakel, 2014, 34). Heidegger also mentions Goethe directly in *The Question Concerning Technology*.
[55] "Wittgenstein's later philosophy was inspired directly by his encounter with Goethe's way of seeing" (Bortoft, 2020, 21).
[56] Max Weber was said by his sister Marianne to have as a child read "hidden under his desk during class, all forty volumes of the Cotta edition of Goethe" (Weber, Marianne, 1926).

influenced to varying degrees by Goethe. Many tomes have been written on Goethe's method, tracing out its fine points, novel concepts, and contextualizing it in the history of thought[57], including as a precursor to Husserlian phenomenology[58] (my studies have in turn revealed that much of Heidegger's philosophy of science is a development of Goethe's own reflections).

My intent however is not to describe Goethe's method at this level of detail. I wish instead to provide historical context, continuing to trace out a lineage of non-technological science that culminates with the Muries. The Goethian Ideal has applications for contexts of management and design and opens an alternative possibility to modern thought, including modern ethics, thus buttressing the development of a wild ethic.

The Goethean Ideal is Goethe's scientific approach, consisting of two separate but related components: 1) A rigorous observational method, and 2) A deliberate beholding of the world's self-transformative presence as a part of, or as a necessary addition to, scientific inquiry. I have described above in sufficient detail the second aspect as adopted and modified by Thoreau and Humboldt. I will thus here mainly focus on Goethe's scientific method[59].

Besides his rediscovery of the human intermaxillary bone, Goethe's best known scientific endeavors are his morphology and reevaluation of Newtonian optics in his *Theory of Color*. Goethe tried here to place the new science of optics pioneered by Newton within natural history and to demonstrate "the basic identity or continuity between observer and observed" (Kuhn, 2009, 65; 83).

Goethe attempted to capture this basic continuity when he later spoke of "delicate empiricism," a phrase now often used to describe his scientific method: "There is a delicate empiricism which makes

[57] See for instance *The Wholeness of Nature* by Henry Bortoft (1996) and *Goethe's Way of Science: A Phenomenology of Nature* by David Seamon and Arthur Zajonc (1998).
[58] "Every phase of the empirical-phenomenological method has its analogue in Goethe's delicate empiricism, which leads me to conclude that, in essence, they are the same method" (Dean Robbins, 2006, 10).
[59] According to ecologist Stephen Harding, this method "has been largely attributed to the German poet and scientist Johann Wolfgang von Goethe (1749-1832) but which in fact can be traced back several centuries before him to Pico della Mirandola, Ficino, Paracelsus and before them to the Hermetic tradition" (Harding, 2007, 528).

itself utterly identical with the object, thereby becoming true theory. But this enhancement of our mental powers belongs to a highly evolved age" (Goethe, 1995). Goethe's delicate empiricism merges the moral and sensual (Kuhn, 2009, 94), while it challenges our sense of theory, recalling instead that of the ancient Greeks—the beholding of an awesome spectacle—or, as Heidegger awkwardly phrases it, "the beholding that watches over truth" (Glazebrook, 2000, 237; Gadamer 1981).

More specifically, theoria was a cultural practice of taking "a journey abroad for the sake of witnessing an event or spectacle" (Nightingale, 2004, 41). Theoria is part of a way of life that lingers with things; while beholding—as opposed to modern theorizing—necessarily places oneself into context, into "an intimate immersion in the world" (Mooney, 2009, 8). Theory is thus for Heidegger "the supreme realization of genuine practice" (Feenberg, 2010, 189), though in his later thinking he comes to believe that "the practical is already the theoretical" (Zimmerman, 1990, 231).

Goethe recalls this original sense by shifting "the meaning of theory…from an abstract, universal generalization to a concrete and intensive perception of the relations among phenomena" (Holdrege, 2014, 21), evident in his claim that "everything in the realm of fact is already theory….Let us not seek for something behind the phenomena—they themselves are the theory" (quoted in Talbott, 2007). Delicate empiricism includes the feeling self in scientific perception, allowing oneself to be absorbed to an appropriate degree by phenomena, in contrast to a Baconian "assertive empiricism," which coldly and mechanically tortures nature (Bortoft, 1996).

Anticipating anthropologist Claude Levi-Strauss's "good to think with," Goethe proposes a form of thinking—"concrete thinking" or "object-like thinking" (*gegenständliches Denken*)—as an appropriate way of relating to the world (Kuhn, 2009, 85). This has been described as "withness-thinking" (Shotter, 2005), thinking with (or through) the object, "carry[ing] with it an implicit ethical or moral responsiveness to the other or otherness" (Dean Robbins, 2006, 6).

Goethe claimed that his "nature studies rest on the pure foundation of experience" thus resounding strongly with later developments akin to phenomenology (Hanser, 1998, 12: 264). In Goethe's approach, as with phenomenology, it is crucial to pay careful attention "to the phenomenon being studied through a process of active looking without attempting to reduce the experience to quantities or explanations" (Harding, 2007, 528).

Goethe did however seek explanatory "laws", in a sense, rather than remaining only at the level of description, or mere classification (in the fashion of Linnaeus). The laws he sought however were very unlike Newton's. They were instead qualitative and sensual, reflecting an integral connection between self and world, "correspond[ing] more closely in form and content to the physical reality perceived by the naked eye" (Kuhn, 2009, 70). Humboldt and Thoreau had similar aspirations. Thoreau in particular sought out sensual laws as part of "a science of poetic or aesthetic experience" through careful analysis of felt experience—a science of beauty that resonates with Aldo Leopold's much later reflection, which opens this section (Ellis, 2014).

Goethe developed a very precise method, and though many of the specifics are not crucial to my analysis, I will briefly highlight certain aspects. Some scholars have broken down Goethe's participatory science into four phases: 1) exact sense perception, 2) exact sensorial fantasy, 3) seeing is beholding, and 4) being one with the object (Brook, 1998). This particular formulation has been applied in practical contexts, notably as described in *Goethe's "Delicate Empiricism": Assessing its Value for Australian Ecologists* (Bradley, 2011).

To truly understand nature, according to Goethe, one must be as fluid in mind as nature is fluid in form. One way to accomplish this is in shifting one's approach between two opposing poles, that is, between idea and experience, general and particular, law and exception to the law, and crucially "constantly and rapidly oscillating between the two antipodal states of selfless immersion in and critical detachment from nature" (Kuhn, 2009, 86). In a marked contrast to Newton's experimental approach,

relying on a singular instance (*experimentum crucis*), Goethe advocated for "a process of observing the phenomenon in a wide variation of contexts, profiles and phases, until the phenomenon finally begins to disclose its dynamic, archetypal form"—a process that has been translated into English as "manifolding" (Dean Robbins, 2006, 10). Each of these methods brought together should lead to an increasing complexity—perhaps conceived in something like a spiral form—of understanding the subject of study.

Many of the complexities of Goethe's methods and scientific approach exceed the scope of my focus. I provide here instead a list of highlights that offer fruitful alternatives to technological science and therefore modern thinking. Many of these are seen reflected in Humboldt, Thoreau, Leopold, and the Muries, some of whom I will return to when outlining the possibility of a wild ethic.

- Goethe insisted on the embodied nature of the knowing self.
- Goethe identified that a social, cultural, and personal component is necessarily embedded to some degree in science (Kuhn, 2009, 87).
- Goethe believed that "the process of scientific investigation was as important as, and in fact inseparable from, the subsequent findings of the investigation" (Kuhn, 2009, 95).
- The Goethean ideal, reflected in Humboldt and Thoreau, is to weave together the abstract and empirical, and the wide variety of ways of comprehending nature—metaphysical, mechanical, mathematical, and moral—into a "multifold language."

> "the scientist might make conscious use of all these modes of thought and expression to convey his view of natural phenomena in a multifold language…he could avoid becoming one-sided, and give living expression to living thought."
> —Wolfgang von Goethe (1996, 12: 277)

- Goethe was concerned with not just how to know the world, but how to see the world correctly.
- Goethe contributed towards a sense of the world as dynamic and temporal—a living entity—rather than fixed and static in a Newtonian or Linnaean sense.
- Goethe's emphasis is on "ethical orientation and individual self-cultivation (Bildung) as well as systematic description" (Böhme, 2012, 14).

- Goethe sought to understand entities and facts in embedded relationships and in a broader context of connections, rather than isolated. In his ideal, it is particularly necessary to understand the natural context into which things are embedded and thus to take an "ecological" approach to scientific findings (Holdrege, 2014).

> "With any given phenomenon in nature—and especially if it is significant or striking—we should not stop and dwell on it, cling to it, and view it as existing in isolation. Instead we should look about in the whole of nature to find where there is something similar, something related. For only when related elements are drawn together will a whole gradually emerge that speaks for itself and requires no further explanation." –Wolfgang von Goethe (1995, 203)

- Goethe's approach necessitates an inner fluidity to match the outer fluidity of nature.
- Goethe's approach necessitates engaging personally and participatorily with a landscape or subject of study.

One of the more compelling applications of Goethe, and similar poetic or manifold approaches, is in medicine. Oliver Sacks's romantic science stands out as an exemplar. In Goethean fashion, Sacks conceives of disease in an ecological manner: "disease cannot be easily separated from how it is manifested in, and embodied by, the patient" (Halliwell, 2016, 210). Goethe himself mainly focused on light (color) and plant morphology. Others, however, including Thoreau and Humboldt, and some contemporary Australian ecologists have focused on landscapes, while similar approaches have also been used in architecture as I will discuss in the next chapter (Hawkes, 2019).

Though certain sciences seem best suited to this manifold approach, it is not restricted to these limited applications. Goethe and Heidegger explicitly examine the basis of physics and thus modern science more broadly. Medicine however is an accessible case that has clear links to ecology, resonating for instance with Aldo Leopold's "land health." I will thus briefly turn to the example of emergency medicine as an application of a Goethean approach.

One way of quickly accessing health in a wide variety of settings, including emergency medicine, is the SOAP note structure, an acronym for Subjective | Objective | Plan | Assessment. SOAP notes are ubiquitous due to their accessible and standardized structure, which can be readily shared between varying medical providers. This format was developed in the late 1960s as a deliberate attempt to counter what was seen as an impressionistic approach in favor of scientific medicine fashioned on the Newtonian model (Halliwell, 2016, 207). Though it includes a "subjective" component, which includes specific non-instrumental details, it nevertheless flattens observation and the observer's perspective into clinical terms, funnels it into "the institutional weight of the chart," and masks both the layers of background uncertainties that are inevitable, especially in complex cases, and the intuitions utilized by medical professionals in real-world decision making (Halliwell, 2016, 210-11).

Oliver Sacks and some contributors to the journal *Literature and Medicine* have advocated a narrative form to better capture the care history for which SOAP notes were designed. Sacks refers to his narrative approach as "clinical tales"—a format that allows the relational interplay of patient and practitioner, the narratives relayed by patients, the aesthetic response of caregivers, and the history of illness—all as components of care—to be more fully captured. The use of narrative does not of course preclude systematic, technical descriptions found in formats like SOAP notes, but it can contextualize it in a way that compensates for the problematic tendencies of technics.

There is a striking similarity here to the interplay of narrative and monitoring in wilderness management as described in Chapter 2, where the wilderness character narrative helps to set the trajectory of wilderness monitoring. Narrative, as a representative of the poetic, can serve as complement to the technical, but more importantly can ground and direct it.

Narrative draws attention to the world's singularity. Moments, places, and encounters with people are particular and contingent rather than mere instantiations of law or universals, in stark contrast to that which can be assured about things—the mathematical. Recognizing this, particulars take

on a renewed importance and meaningfulness, evident in how things are actually experienced. Albert Borgmann describes this shift accordingly: “While contingency heightens presence, lawfulness diminishes it, theoretically by reducing full-bodied things to instances of scientific laws and practically by furnishing the explanations that make technological control…possible” (Borgmann, 2006, 17). Poetics, as I shall describe in the next chapter, focuses on contingency, singularity, and wonder. The appeal to the singular does not however negate the universal: “the rendering of particulars truthfully, responsively, can sound a universal and necessary note” (Mooney, 2009, 45).

It was precisely this betrayal of contingency that drove Thoreau’s, Humboldt’s, and Goethe’s struggles with the emergence of modern science, purified of experience. Humboldt, for instance, realized that the singularity of places could only be known through the senses, not scientific methodology or measurement, and so he actively sought to overcome this deficiency through his scientific practices (Meinhardt, 2019, 165). Other romantic thinkers saw darker portensions in the Enlightenment emphasis on the rational and the universal. Johann Georg Hamann, an acquaintance of Kant, reacted to what he saw as “prisons of the spirit” (Berlin, 2012, 10): “The universal systems favoured in the Enlightenment were seen by the romantics as ‘prisons of the spirit’; in a drive to generality, the system tends to neglect the particular and unique” (Halliwell, 2016, 21). This neglect culminates ultimately in the “iron cage of rationality” later identified by Max Weber.

Wonder Lost?

"Wonders precisely defy domestication by science, critical theories, or hermeneutical suspicions. A wonder explained is a wonder no longer sustained." –Edward Mooney (2009)

"So what we must have is poetry within the scientific, physical worldview."
–E.O. Wilson[60] (Barlow, 1997)

Richard Dawkins's book *Unweaving the Rainbow* takes its title from a line in the poem *Lamia* by the romantic poet Keats. Dawkins seeks to counter the notion that science diminishes a sense of wonder and awe at nature by arguing that science, in revealing the workings of nature, unlocks entirely new realms of wonder, even as it shatters the wondrous, yet unsubstantiated, myths that precede it. In a similar book, *The Magic of Reality*, Dawkins claims that "science is the poetry of reality" and "the real world, as understood scientifically, has a magic of its own—the kind I call poetic magic" (2012, 31). Scientific information, in Dawkins's view, in revealing the minute inner workings of nature, is the primary source of wonder—what has elsewhere been called the "technics of nature" (Böhme, 2012, 177) is a kind of poetry itself.

"This blending of the poetic and the scientific," in conveying awe without the supernatural, recalls the "scientific sublime": "the capacity of the vision of nature revealed through science to summon forth the same sense of majesty and power that human beings feel in the presence of God" (Neeley, 2001, 8). By one account, the scientific sublime has a practical function within the scientific enterprise:

> Awe is required not only for the day-to-day working of science, but is also crucial to help reorient scientists' thinking in times of paradigm change. It provides constant emotional motivation for scientists to continue their work, and it instils openness to scientific ideas in the public. While precision and rigour are important, the emotional drive of awe is what matters – it might be…our only path to knowledge and wisdom (De Cruz, 2020).

[60] Also: "One word: poetry. That's what the world has to offer us. A whole series of mysteries, of possible discoveries, of phenomena, of unexpected events, and objects, and things" –E.O. Wilson (2020)

However, while awe and wonder are undoubtedly part of the scientific enterprise and are rightful responses to science's unveiling of nature's causative interconnectedness, there are significant ways that modern science is inadequate in apprehending and relating to nature, while scientific information, even when artfully conveyed, is a deficient poetics.

There may be a scientific sublime, but scientists must suppress their awe to submit to the discipline of scientific practice and funnel their findings into technical papers. Data collection requires a degree of detached, dispassionate observation, and technical writing requires the siphoning of perception. In sum, modern science as practice and as professional literature requires that poetics must be stripped away.

Dawkins's equivocation of scientific explanation with the source of poetic awe is akin to Kant's sense that an awareness of the moral law—an abstract universal—is on par with gazing at the starry heavens above in their sublimity and thus significance. Dawkins (and Kant) celebrate lawful explanation, not fully recognizing the modern propensity to reduce contingent singularity to an instance of law, thus denuding the world of presence and meaningfulness (Abram, 2012; Borgmann, 2006).

Dawkins's account, in contrasting myth, miracle, and unscientific explanation to scientific explanation, rather than with direct experience—the concern of Goethe—misses the main point of comparison. In his rendering, scientific information takes precedence over direct encounters with nature, blurring any meaningful distinction between science and nature (Sideris, 2013, 147). This is most evident when he refers to a rainbow as an illusion (Dawkins, 2012, 147).

Dawkins's equivocation has two major implications. First, devaluing experience in favor of scientific reality "puts environmental values on shaky ground" (Sideris, 2013, 147) insofar as they can be grounded, as I believe is possible, in experience, rather than reason alone. This is an integral component of Goethe's ideal: perception is itself a basis for value (Harding, 2007, 529; Fischer & Nassar, 2015, 10). Second, as writer and philosopher David Abram has pointed out, most people lack ordinary experience

of scientific realms and so must rely on experts as mediators of truth (Abram, 2010, 5). Together, these estrange us from place and immediacy, and bind us to abstraction. The mathematical holds sway.

It is with these considerations in mind that I now move into a detailed discussion of poetics in the following chapter. In this chapter, I have uncovered a lineage of thought and practice that eventually yielded the Muries' approach towards wildlands management and science, reacting against the "technologists" and the Craigheads' "gadgetry". My purpose in relating this is the intention of finding a chink in the armor of technological thinking that can then be used as a foothold for renewed ways of knowing and managing in a seamless relationship with ethics.

Chapter Five: The Poetics of Environmental Management and Design – Part One: Poetics

"I only wish that the first really worthwhile discovery of science would be that it recognized that the unmeasurable is what they're really fighting to understand, and that the measurable is only the servant of the unmeasurable; that everything that man makes must be fundamentally unmeasurable."
–Louis Kahn (1969)

Keeping, tending, or managing the wild is a paradox. Nature loses something of its wildness once brought under the wing of human concern. Although human impacts on nature are often thought to also curb nature's wildness, not all impacts are the same. Some, like climate change, biodiversity loss, invasive species, and certain forms of pollution are globally pervasive and have been, up until now, inadvertent. For climate change in particular, the present challenge is to shift from inadvertent impact to deliberate design of the global climate. This is no small feat, requiring complex, international negotiations that involve every sector of the economy with millions of human lives and the existence of nations at stake.

Nor is it a small change in our relationship with the planet. Humanity has inadvertently become a global, geological force. Now we must become deliberate designers of the climate. As our technological power increases, so do our impacts, as does the necessity and possibility of design. As we liberate the planet from environmental degradation and pollutants, however, a new risk emerges—that the global climate and other aspects of our world become technological artifacts.

As I mentioned in Chapter 2, science, while integral to shaping a sustainable, livable future, is also implicated in technocratic management—as is modern ethics. Without something akin to the impulse in John Muir or the cultural traditions of the Tlingit—if we slip into conceiving and treating the earth as merely an engineering problem or purveyor of services—we risk living on a sanitized earth—a dystopia of total technical design.

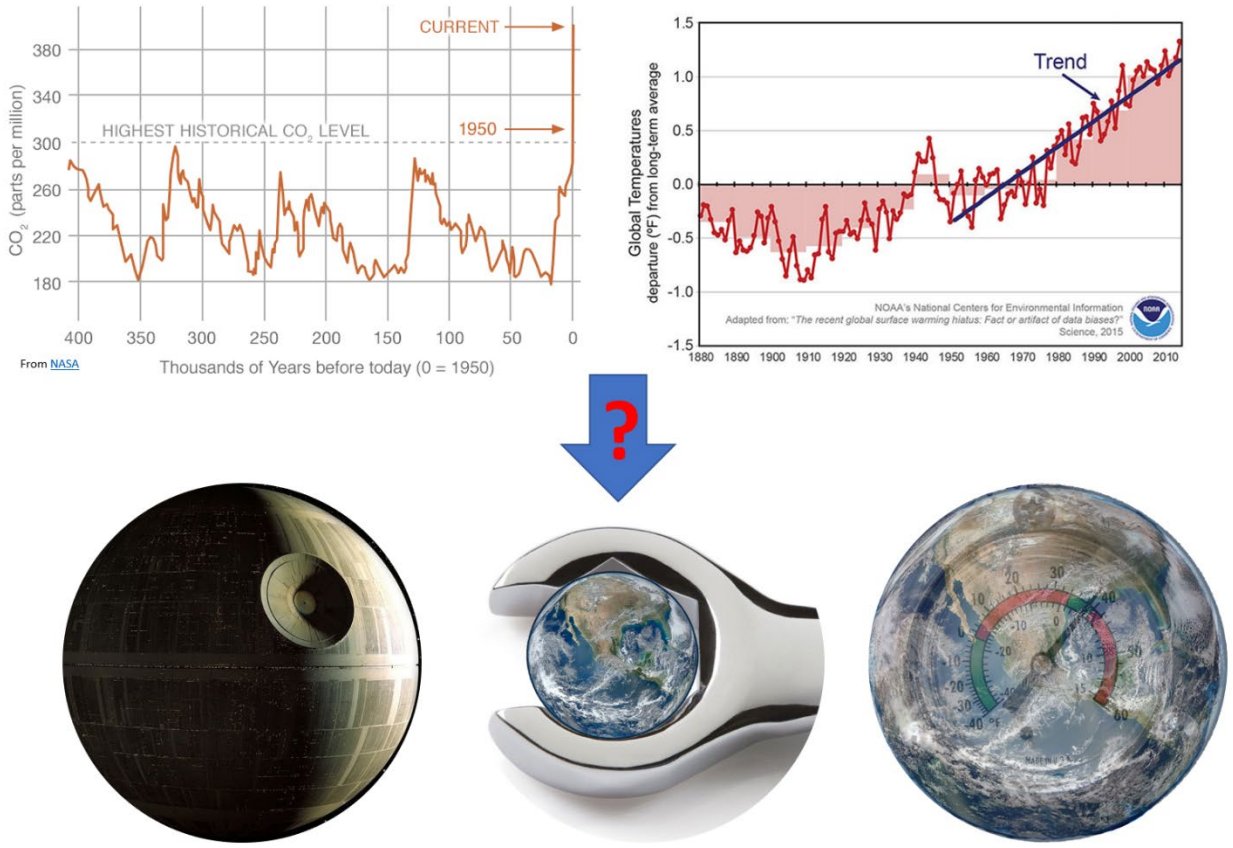

Figure 8: Technocracy?

Wildness is not a criterion that any regulatory body, UNFCCC conference, or scientific agency considers in its negotiations, policies, or evaluations. However, it is to differing degrees a formal or informal goal of wildlands preservation. Managing implies deliberate action. Managing a place that is meant to retain wildness is thus paradoxical. Restoration parallels and amplifies this paradox—design is obvious in this context. This paradox however opens new liberating possibilities, rather than culminating in a sense of hopelessness and futility. There are lessons from wildlands management that can give important insights into planetary management.

Not all management is the same. I provide in this chapter another possibility for management, utilizing the vocabulary of design, that may thread the narrow gap between collective, unintentional degradation and technical control. First, I offer a vision for design that integrates poetics as a deliberate

antidote to the technical, before expanding on the concept of poetics, beginning with how it is taken up by Heidegger in his later works as an explicit response to what he sees as the danger of technology. I then return in the next chapter to wildlands management and planetary design.

Technics and Poetics of Environmental Design

"The ideal of an organic architecture...is a sentient rational building that would owe its 'style' to the integrity with which it was individually fashioned to serve its particular purpose—a 'thinking' as well as 'feeling' process." —Frank Lloyd Wright (1914)

"The reality of the building does not consist in roof and walls but in the space within to be lived in." —Laotse (qtd. in Athitakis, 2019)

An enlightening analysis of design is given by Dean Hawkes in *The Environmental Imagination: Technics and Poetics of the Architectural Environment*. Architectural design, according to Dean, is severely limited, and in fact offensively severe, when unduly constrained by the technical. What is required for successful environmental design in architecture is an expressly subservient relationship of the technical to the poetic: "the significant environmental propositions in architecture rest upon acts of *imagination* in which *technics* are brought to bear in the service of *poetic* ends" (Hawkes, 2019, vi).

This is a departure from a long-running modernist trend toward "reductive codification and specialisation," "vulgar" quantification, and an emergent environmental design defined almost exclusively by technology (Hawkes, 2019, xi, xv, 3). This shift was due to the emergence of architectural science out of and away from a more holistic premodern sense of design, thereby eroding the longstanding "complex unity of the symbolic and the practical" (Hawkes, 2019, xi). While it is possible to "quantitatively and precisely specif[y] environments [that] can be delivered by calculated configurations…this success has, it seems, often been bought at a high price" (Hawkes, 2019, xiii). This price is the neglect of the "complex sensory experience" that allows an experiential merging of space and time, and a reconciliation of self and world.

In focusing on the instrumental, functional elements of heating, ventilating, and lighting—rendered through the mechanisms of engineering to procure human comfort—technics in other words—architecture is reduced to "a mere mechanical art" at the expense of the place-specific, qualitative character of design—a poetics captured more fully by terms like atmosphere, tone, mood, milieu, or character.

Achieving this appropriate collaborative synthesis of technics and poetics requires an environmental imagination that is able "to envision the outcome…set within the physical facts of the climate and locale, in ways that inform and enhance the purpose and meaning of a building" (Hawkes, 2019, 200). Rather than designing according to the mandates of calculation and analysis, which inevitably reverses the appropriate order of technics and poetics, "informed intuition" is essential—the basis for architectural methods that are instead "supported by the security of memory and experience" and thus "free, but not arbitrary" (Hawkes, 2019, 212).

A few things stand out in this example: it provides an appropriate relationship between means, ends, the measurable, and the unmeasurable; and, while retaining a substantive role for science and technology, creates an essential place for intuition and imagination, meaning and purpose, and what is referred to as "character". This term has come up previously in this dissertation in the context of wilderness character—a "holistic concept" at the intersection of biophysical environments, personal experiences, and symbolic meanings of places (Landres, et. al, 2015, 2).

As a foundational management document, the wilderness character narrative is meant to "recognize the broader and holistic meanings of wilderness character for an area…capture the feelings and relationships of a wilderness...[and] acknowledge, celebrate, honor, and respect the intangible, experiential, and inspirational aspects of a wilderness (Landres, et. al., 2015, 83). It thus does more than "complement and enhance" scientific monitoring: it serves as the poetic foundation of technical

monitoring and management. The narrative, in other words, legally and practically establishes a proper subservient relationship between technics and poetics—at least ideally.

There are interlinking relationships between technology, art and nature, management and design, knowing and ethics, technics and poetics. Heidegger's questioning of technology begins to make explicit some of these connections.

Technical Danger, Poetical Hope

> "Without the poetic element in our own being, and without our poets and their great poetry, we would be brutes." —Albert Hofstadter (1971)

> "He weighs and measures constantly, yet does not know the real weight of things." —Martin Heidegger (1971d)

As I related in Chapter 3, in *The Question Concerning Technology*, Heidegger diagnoses the danger of losing everything, including ourselves, into the objectlessness of enframing. Yet, there is hope in the "saving power." Heidegger famously appeals to the romantic poet Hölderlin for the seed of this hope: "poetically man dwells on this earth" (1977b). It is thus to art and poetry—as manifestations of revealing; bringing-forth; poiesis—or the poetical more broadly—that Heidegger turns. Art, Heidegger insists, must reflect on technology and confront it (1977b). It is to this possibility that I now turn—the "solution" Heidegger identifies to the "problem" of technology as I described it in Chapter 3.

Techne, the etymological root of technology, Heidegger tells us, is more than technology, encapsulating craft, art, and thought, and "belongs to bringing-forth, to poiesis; it is something poetic" (1977b). Technology too is a revealing, but one that challenges, rather than brings, forth; technological enframing originates in, yet blocks, poiesis (1977b).

There are thus within Heidegger's analysis two primary forms of revealing: technology and poiesis, or as I have rendered them, technics and poetics—one a challenging, the other a revealing that brings forth and makes present. This division is evident in Heidegger's contrast of a dam (technics) and

"'The Rhine,' as uttered by the artwork, in Hölderlin's hymn by that name" (poetics) (1977b). Furthermore, "from earliest times until Plato the word techne is linked with the word episteme. Both words are terms for knowing in the widest sense. They mean to be entirely at home in something, to understand and be expert in it. Such knowing provides an opening up. As an opening it is a revealing" (1977b). Poiesis (and a more originary sense of techne) is rooted in knowing in the fullest sense of being at home in something. This hearkens back to the discussion in the last chapter (4) on the varieties of ways of knowing, many of which seek to restore this sense of experiential, embodied, or practical knowing, in response to the narrower constraints of modern science.

In the *Question*, Heidegger discusses poiesis and poetics, but mentions poetry once only to situate it within a broader poetics. Though poetry itself is not his primary interest in this essay, he does draw on Hölderlin's poetry to address technology, while in various other works in his later period, he takes up poetry directly. For instance, in *Poetically Man Dwells*, Heidegger provocatively declares that "poetry is a measuring"—"a measure for all measuring" (1971a, 219, 224). This, in sharp distinction to the fundamental mathematical basis for knowing central to modern thought. Heidegger's turn toward poetry and poetics is thus clearly connected to his critique of modernity and central to many of his other concerns, such as dwelling and the fourfold. And, while poetry is important, it is not the key to a new liberated relationship with technology; poetry is merely a predominant instantiation of poetics.

In *Poetically Man Dwells*, Heidegger goes on to say that "it might be that our unpoetic dwelling, its incapacity to take the measure, derives from a curious excess of frantic measuring and calculating" (1971a, 226). This measure is the world's presence; the measuring is the active beholding of things. This should sound familiar from my discussions of Goethe, Humboldt, and Thoreau in the last chapter, all of whom incorporated such "measuring" into their scientific practices in reaction to an emerging modern science afflicted by "frantic measuring and calculating."

The world's presence is evidently what Heidegger has in mind as the measure when he refers to it as the appearance of the sky (1971a, 224); and again, "Because poetry takes that mysterious measure, to wit, in the face of the sky, therefore it speaks in 'images'" (1971a, 223); and finally, as a measure that "remains a listening":

> A strange measure for ordinary and in particular also for all merely scientific ideas, certainly not a palpable stick, or rod but in truth simpler to handle than they, provided our hands do not abruptly grasp but are guided by gestures befitting the measure here to be taken. This is done by a taking which at no time clutches at the standard but rather takes it in a concentrated perception, a gathered taking-in, that remains a listening (1971a, 221).

While this measure may be a listening and "concentrated perception," language is also crucial: "language…tells us about the nature of a thing" and "gives us a standard…by which we can take the measure of the nature of dwelling and building" (1971b, 144). Yet, "In poetry, Heidegger said, words withdraw so that things may be" (Zimmerman, 1990, 124). This relationship of presence and poetry thus demands further clarification.

In Chapter 3, I outlined what I referred to as technics, providing nine characteristics[61]. I clarified that here I mean something broader than technology, as the word is used in typical discourse—something more akin to the sense of technology utilized by Heidegger, which includes how we apprehend and represent the world. Likewise, just as technology is far more than machinery and material devices, poetics, as I use the term, is far more than poetry: it is rather a form of interactional attunement to the world, capable of restructuring language, thinking, and environmental management.

Poetics is often defined as the craft, or, for instance, "the theory and practice," of poetry (Crystal, 1990, 954). This is not however the exclusive meaning that Heidegger nor I have in mind. I will start by summarizing some of Heidegger's key insights about poetry and poetics before moving beyond Heidegger, and finally further considering how this applies to management and design.

[61] These are: 1) Rationalization, 2) Procedural (Methodical), 3) Substitution (Internalization), 4) Action Independence (Decontextualization), 5) Disassembling, (Simplification), 6) Functional Reductionism, 7) Mathematical, 8) Experimental, 9) Change of Structural Conditions (Dispositif)

Poetics is for Heidegger a preservative attentiveness to nature's spontaneous unfolding—its poietic, self-emergent, character. And it is this that grounds dwelling—how we humans are fully at home in the world in an immersive, caring relationship with our surroundings. Poetics can be expressed through human creative action in art, architecture, literature, or poetry insofar as these leave space for the world's own revealing, as it is physis—nature's spontaneous unfolding—that is the highest poiesis (1977b)[62].

Poetry itself is nevertheless central to Heidegger's concern: "the linguistic work, the poem in the narrower sense, has a privileged position in the domain of the arts" (1971c, 71). Poetic language can gather and disclose the world, "hold[ing] together the agonistic relationship between nature and humanity in such a way that a space is opened wherein entities may show themselves" (Zimmerman, 1990, 118). Poetry "lets": it "lets the thing appear and therefore come to presence as the thing that it is" (1982). Poetry should thus not be thought of as a mere cultural achievement or even a human production (Heidegger, 1989).

It is the poet in our era who must forge experience into linguistic expression. The poet who retains a poetic imagination can shape words that ultimately withdraw, leaving sheer wild presence: "the poet always speaks as though [beings] were being expressed and invoked for the first time...[losing] all indifference and commonplaceness" (Heidegger, 1961). The poet is needed because although poetry is in fact the "primordial form" of language (Bambach, 2017, 48), language has in our era lost its way: "Poetry proper is never merely a higher mode…of everyday language. It is rather the reverse: everyday language is a forgotten and therefore used-up poem, from which there hardly resounds a call any longer" (Heidegger, 1977b).

[62] Heidegger's sense of poetics would later be taken up by Albert Borgmann as "grace"—a quality and a virtue that must be actively cultivated, yet only hopefully, as part of its power remains necessarily beyond our resolve. Grace is found in "the sparkle of a person and…the force that lends the person radiance," "the spirit of a work of art," and "the charm of a doe," while "it can suffuse a mountain lake," and is evident in aspects of religious practice (2010, 191, 123). Art, however "is the realm where once the several appearances of grace were one" (2010, 123).

Poetics is necessary to reshape both language and thought. While Heidegger at times briefly mentions "poetic thinking" (1977b; 1961), he also speaks of "meditative thought" as opposed to calculative thought. He formulated this distinction in his 1955 *Memorial Address* for composer Conradin Kreutzer on the 175th anniversary of his birth. Despite its name, calculative thinking is not necessarily related to numerical calculation or even computing machinery. Rather, "it computes ever new, ever more promising and at the same time more economical possibilities. Calculative thinking races from one prospect to the next. Calculative thinking never stops, never collects itself" (1966). Calculative thinking has also been interpreted by one scholar as "focus[ing] only on utility or immediate functional worth"—technical thought in other words (Malloy, et. al., 2014).

Meditative thinking on the contrary is attentive and open to "the meaning which reigns in everything" (Heidegger, 1966, 46). The meaning of things and of technology is hidden behind calculative thinking. The problem is not the presence and rapid development of technology itself, but "our inability to confront meditatively what is really dawning in this age"—contemporary humanity is instead "in flight" from such thinking (Heidegger, 1966).

Heidegger has vital insights into the perils of technology and the possibility of confronting it. New forms of thinking, speaking, and being can be found in his affirmation of poetics. Heidegger however does not have the final word on poetics. In the *Question* and elsewhere, he finds hope for a renewed relationship with technology and nature in the poetry of Hölderlin, allowing us to move beyond productionist metaphysics and technological nihilism, and towards homecoming and remembering. There is within this hope an indispensable core—that ek-static poiesis may break "open the closed world of total management" (Irwin, 2015, 64).

Heidegger was however limited by his time, his place, and his prejudices in crucial respects. His overwhelming emphasis was on Hölderlin specifically; mine is not at all. And within this emphasis, Heidegger interpreted Hölderlin to believe that "nature 'needs' humanity…for the self-disclosure of the

earth[63]" (Zimmerman, 1990, 125)—a view that need not be integral to poetics. Heidegger was also confined by his German exceptionalism and ultra-nationalism, including a selectively illiberal interpretation of Hölderlin. My intent is thus to take up some of Heidegger's crucial insights while hopefully leaving behind his limitations.

Heidegger's thought opens the possibility for an "ecopoetics" that can meaningfully engage with technology and environmental decision making (Peters & Irwin, 2002). I next launch out from Heidegger's platform, expanding the possibilities and perspectives of poetry and poetics. My intent is by no means to exhaust the topic.

Living Poetry

"Is it the lumberman, then, who is the friend and lover of the pine, stands nearest to it, and understands its nature best?...No! no! it is the poet; he it is who makes the truest use of the pine."
—H.D. Thoreau (1864)

"My feeling is that the paths of poetry and of meditation are closely linked—one is an attentiveness and awareness that exists in language, the other an attentiveness and awareness that exists in silence, but each is a way to attempt to penetrate experience thoroughly, to its core." —Jane Hirshfield[64]

I begin here by summarizing the fundamental aspects of poetics relevant to my use of the term, which I will further clarify throughout the next two chapters:

- *Poetics is not poetry; but just as mathematics epitomizes the mathematical, poetry epitomizes the poetical.*
- *Poetics is often structured by language, but words merely reflect a quality and degree of reflective attunement.*

[63] As an interesting aside, Heidegger's position (and probably misinterpretation of Hölderlin) is strikingly similar to the views of many indigenous peoples; the Cree, for instance believe that "a continued, proper use is necessary for maintaining production of animals" (Berkes, 2018, 110).
[64] In Curran, 2013

- *Words—poetry—can in turn hone our attunement, awakening "new depths in us"* (Bachelard, 2014, 7*).*
- *There are a poetics and technics to poetry (and to mathematics).*
- *Poetics is an experiential and embodied reception to things and places reflected practically in design.*
- *Poetics has been applied to design in contrast to technics, but it has not been applied in this way to wildlands or to large-scale environmental issues.*
- *Design, however, has, e.g., Eric Higgs's wild design.*
- *Poetics provides a necessary antidote to technics; it provides a way out from the "mathematical".*
- *Rather than designing or managing according to mathematical abstraction, poetics should be integral to both.*
- *Poetry, like poetics in the context of design, encapsulates experience.*
- *Modern science "represents" and "projects" losing the "voice" of nature into lifeless abstraction; poetics instead responds to the appeal of presence—to the wildness of things.*
- *Making room for poetics goes some way toward liberation from the "iron cage."*
- *Poetics retains meaning and purpose and the fullness of things.*
- *Poetics is also relevant to ethics: wild ethics is experiential and evocative and is thus a needed counterweight to the technological thinking inherent in modern ethics.*

The world is blooming before us—
bubbling into a multiplicity of form—
duplicitous in scope, rich in array—
more stew than cosmograph:
simmer in its seasoned depths—
tasting
its mar-red marinade
soaking
in its quaint quandary

Poetics begins with receptivity and attentiveness to the world's presence, "hearing and feeling as well as crafting and shaping" (Bachelard, 2014, xix). This attentiveness should in turn have a transformative effect on the individual, or as Thoreau put it, "the true poem is," not verse, but "what [the poet] has become through his work" (1849); or as Edward Mooney has it, "our salvation lies in translating ourselves into the poetry of the world" (2015, 234).

Poetic perception is meditative in Heidegger's sense, but perhaps not in the originary sense rooted in the states of meditative consciousness sought in many eastern traditions, typified by detachment, aspirations towards egolessness, and often culminating in a sense of ultimate oneness. Wakefulness and receptivity are integral to poetics, yet poetics can instead rely on imaginative or metaphorical consciousness (Gilcrest, 2002, 127).

Deliberate attentiveness to presence is uniquely required in our era due to the technological context that Heidegger identifies. Philosopher Walter Benjamin made a similar prognosis when he identified the loss of "aura" in art, and thus nature. Aura here is the "nebulous quasireligious halo enveloping premodern art" (Böhme, 2012, 16). Due to mechanical, technically perfected, mass reproduction, however, art has lost its singularity, and thus our awe and respect for it. Though an often-overlooked coupling, art, nature, and the self have formed a conceptual complex in western thought—a shift in one implies a shift in the others. Mechanical reproduction is therefore not limited to art: even our own bodies have become "technologically reproducible contingencies," while nature has become "redundant as a focal point of cultural experience" as it too has become technologically reproducible (Böhme, 2012, 28-9). Nature—both external and contained within our bodies—is thus radically devalued.

Poetics reaffirms singularity. Poetry stands out as it is "irreducible to the calculus of science or governmentality" (Peters & Irwin, 2002, 8) and "is our way of stepping outside the frame of the technological, of reawakening the momentary wonder of unconcealment" (Peters & Irwin, 2002, 4). In

this way, poetic perception leaves a space for wildness to intrude. Ultimately this perception needs to infiltrate our thought and be translated into language.

Rousseau, in his *Essay on the Origin of Languages*, offers a mythology of rhetorical regression whereby the passionate speech of the Golden Age was a "language of poets" that has degraded into a "language of geometers": "the abstract, analytic form of language that, while clear, concise, and efficient," is, as Rousseau characterizes it, "frigid and monotonous" (Rousseau, 1997, 265; Kuhn, 2009, 50). What is needed is "a new song that…seamlessly merges poetry and science"—a language for the future rather than "a nostalgic wish for different enchanted times" (Kuhn, 2009, 45; Mooney, 2005, 221).

A very similar prognosis is found in Heidegger's lament of the "technization of all languages into a merely functional interplanetary instrument of information" (Heidegger, 1985, 160), and in his own attempts to fashion a reanimated (verbal) language that defies objectification and the technical revealing of *Bestand*. Rousseau's plea is also mirrored in Goethe's call for a "multifold language" and his attempt to develop a language "that would 'protect nature' by adequately imitating its processes" (Kuhn, 2009, 94).

Poetics can manifest in various linguistic modes, whether narrative or verse. In either case, the writer or poet testifies to experience by "bring[ing] out the full glory of presence" (Mooney, 2005, 217). Thoreau describes the poet's role as nailing "words to their primitive senses…transplanted…to his page with earth adhering to their roots" (1862). "The earth is…living poetry," Thoreau declares (1854, 298), and the task of the poet is to somehow bring this onto the page and into speech, thus restoring the earth's living presence and the unceasing newness of every moment.

Philosopher Edward Mooney insightfully observes that "as they become part of deadening chatter or routine, words can begin to sound like administrative or legal protocols. A poet undoes the hardening of words, returning new life to them as they roll out in phrases and sentences, and so the

world is reanimated." And, in an echo of Heidegger's aforementioned observation on the role of the poet as needing to speak the world as if "expressed and invoked for the first time" (Heidegger, 1961), Mooney notes that "poetry encompasses all living knowledge and literature; it delivers worlds as fresh and new as a newborn child. In poetry worlds are born again" (2005, 198). Mooney offers here a bounteous and welcome expansion of the boundaries of poetry well beyond the poem. From Thoreau and Mooney, we receive a new sense of poetry as the totality of the living earth, living thought, and living language. This challenges boundaries and raises questions about the limits of language.

The Voice of Nature?

"Language is everything, since it is the voice of no one, since it is the voice of the things, the waves, and the forests." – Maurice Merleau-Ponty (1968)

"We are in danger of forgetting the language which all things and events speak without metaphor, which alone is copious and standard. Much is published, but little printed." –H.D. Thoreau (1854)

One powerful account of democratization focuses on the increasing representation of an ever-wider array of groups and people—giving voice in other words to women and people of color. There is a parallel portrait of environmental ethics as an expansion of the range of those considered ethical subjects; for instance, Aldo Leopold's *A Sand County Almanac* contrasts our own still-evolving ethic with that of Homeric Greece where the property status of slaves made them utterly disposable. Now, slavery is illegal and, ideally at least, ethical precepts apply equally to all. Western ethics, in Leopold's account, has evolved from a relation between individuals, to a relation between individuals and society, and finally to a relation between humans and land (1949, 191).

Ethical considerability in a democracy entails representation. Nonhuman nature, by this account, can thus be considered "an oppressed and silent class, in need of spokespersons" (qtd. in Buell, 1995, 21). There would seem to be an impasse however—a limit to the possibility of representation when ethics jumps beyond the bounds of the interhuman to include the nonhuman. Surely it is the case

that “nonhumans cannot directly authorize their representatives or hold them accountable” (Brown, 2017, 3)? At minimum, there is a potentially unanswerable epistemic question as to how we can possibly know if we faithfully represent nonhuman nature. Questions of ethical considerability and political representation aside (particularly these standardized accounts of the nature of ethics), however, my interest is in how we can subvert technocratic management, based as it is on a vision of nature dead and dumb.

From the perspective of modern science—the basis of technocratic management—there is no voice of nature; the best we can do is to measure and thereby translate nature into mathematics. Or, more potently, mathematics is often described *as the* language of nature, obliterating the tracks of translation. Modern science is in this account the proper mode of representing nature. Thoreau however gives a radically divergent vision than the standard modern account: *poetry* is instead the language of nature. The former implies an undue passivity and muteness on the part of nature, but how does the latter escape this? Why is a sensorially based representation of a living earth rendered by a living language preferable?

Thoreau is by no means alone. There are two main (though possibly interconnected) lineages of voiceful nature: first, a rich, diverse, and longstanding tradition amongst countless indigenous peoples throughout the world; and second, the broadly romantic lineage into which I include Thoreau. I will only briefly touch on the former as the latter is my primary focus for this dissertation. This allocation of attention is not at all meant to create a hierarchy of importance between the two.

Animism is a common but by no means universal conception of the world held by indigenous peoples. More typically it is defined as a belief in the presence of spirit, soul, or sentience in the nonhuman world. For instance:

> Generally speaking, animism credits natural phenomena with spirit and soul, and attributes life to such being and phenomena as animals, trees and celestial bodies (Bird-David, 2002, 74). Animism has also been defined ‘as an ontology that postulates a social character to relations

> between humans and non-humans: the space between nature and society is itself social' (Viveiros de Castro 2004: 481, see also Viveiros de Castro 1998) (Helander-Renvall, 2010, 47).

Such definitions often exclude direct references to "speech" and "voice", but this can be inferred when characterizing nature as social or sentient. On occasion, this is explicitly included as a characteristic of animism. Russian anthropologist Vladimir Bogoraz described animism to include an understanding that "everything has its own voice" (qtd. In Pederson, 2001, 413). Philosopher, essayist, and cultural ecologist David Abram has also referenced speech in his analysis of animistic perception in relation to literacy[65].

Returning to the romantic tradition, philosopher Max Oelschlaeger has for instance written that "wild nature will fable (from fabulari, to talk), that is, speak through a person if that person will but let natural phenomena have voice, and such a speaking will be as if literally true, alive, and organic" (1992, 279). Edward Mooney likewise states that "lyric testimony gives voice to the very things its songs enfold. The truth to which it aspires is truth not of statements or propositions but of the realities it conveys, delivered directly to us, point blank" (2009, 49). Or again, from another of his works: "the poet…lets things speak," while "the genius of poetry is the genius of particular things…poetic intelligence bursts from the world…it…speaks eloquently" (2005, 54; 53). Other poets and thinkers like Ted Hughes and Angus Fletcher have been interpreted to espouse an ecopoetics that "takes part in ecological

[65] "Consider the propensity of such oral persons to find themselves being addressed, or spoken to, by various other beings in the visible, sensible surroundings – by birds, by Coyote, by the tracks of animals, by the rustling, whispering leaves of an aspen tree, or even by the blossoms of a particular medicinal herb…consider the act of reading, say, the morning newspaper. You come into the kitchen, brew a cup of coffee, pick up the paper and focus your eyes upon the written letters, upon those bits of ink arrayed in lines across the page. And straightaway you hear voices – the phantom voice of the writer, or the voice of the president and that of the German Chancellor Angela Merkel as they converse at the G20 meeting in Turkey. You hear conversations, and you see visions of events unfolding in other places. This is not that different from a Hopi elder who is walking outside the pueblo when she notices a rock covered in crinkly red and grey lichens. She focuses her eyes on the lichen, and suddenly hears the rock addressing her. Or a Lakota man out hunting in the forest who is stopped short by a spider weaving its delicate web between two branches across the trail. He focuses his eyes upon the spider, letting himself be drawn into a trance as he sees her set the silken struts of her web, and then unexpectedly hears, or rather feels, the spider speaking to him. It's the same with our newspaper: we let our focus be drawn by a particular article, and we focus our gaze upon these ostensibly inert, inanimate bits of ink on the page, and straightaway we feel the page speaking to us; we hear spoken words, we see visions. Much as other animals, plants, and even "inanimate" rivers once speak to our indigenous, oral ancestors, so the "inanimate" letters on the page now speak to us!..."while the tracks of bear or the bouncing branch of a spruce tree might speak in strange ways (and say very weird or unexpected things), the written letters always speak with a human voice" (Abram, 2018).

relationships in an intrinsic way" where "poetry is not merely a description or representation of nature, it actually *is* nature" (Lidström & Garrard, 2014, 8). These all meanwhile seem to resonate with Heidegger's sense of poetics[66].

How is this possible? By what means might the voice of the nonhuman be rendered by humanity? A mimetic mirroring allowing one to channel or speak as nature through text (as the thinkers above imply)? Or rather a speaking on behalf of nature imperfectly filtered through one's desires, perceptions, and cognitive and linguistic limitations (Gilcrest, 2002, 65)? Some of the authors above point to moments of silent sensual communion. Or more profound moments of stepping beside oneself—literally ecstatic encounters. As has been widely noted, ec-stasis is literally standing (stasis) outside (ec). In those moments, one's self is said to shrink to an indistinguishable point, and one could say, if one were then possessed with words, "I am place" (Mooney, 2009, 63). In stark contrast to the mathematical a priori projection of certitude on experience, here the a priori is left scattered in shards and one has no project left to project. If such perception—such seamless intimacy—is indeed possible, then the prospect of taking on the perspective of some aspect of nature—or utterly losing oneself in presence of place—is as well, enabling such radical mimesis to be expressed, if imperfectly, through ecstatic writing.

A view commonly found in, but not limited to, the social sciences is, however, that "immediate access to nature" is naïve, and "wordless communion with nature," particularly if understood to be

[66] Others that could be included here are Albert Borgmann's occasional reference to the "eloquence of nature" (1984) and Henry Bugbee's reflections on instructions intimated through "flurries of snow," and the cry of aspens and larches (1999) or John Muir's reflection that "One fancies a heart like our own must be beating in every crystal and cell, and we feel like stopping to speak to the plants and animals as fellow mountaineers" (1911).

Also, "Space appropriated through grids and instruments may be called technological. Technological space has little need for the eloquence of nature. Hence it replaces what was once understood to be the natural coherence of space with an abstract matrix or scaffolding in which natural places are arbitrarily, though controllably, located" (Borgmann, 2008, 7).

culturally unmediated, is impossible according to a "broadly post-structuralist" perspective (Halliwell, 2016, x). This position is well represented by Latour, who develops…

> A constructivist theory of representation as a process that transforms what it represents [wherein] the represented are at least partly constituted by the process of representation itself. In Latour's terminology, representation involves mediation and translation between various spokespersons and the hybrid associations of humans and nonhumans that they represent" (Brown, 2017, 2).

Though this constructionist position is in important respects quintessentially modern, there is nevertheless a looming epistemological question as to how we can ever know whether nature has a voice and if it is represented authentically, even if we assume, contrary to Latour, that such representation is possible. In other words, "this kind of vatic environmental poetics incurs the epistemological critique" (Gilcrest, 2002, 63).

There is yet another significant criticism: some challenge the discourse of "speaking for nature" as not only misguided, but authoritarian (Brown, 2017, 4)—an aspect of "ecofascism" perhaps[67]—insofar as public discourse is suppressed in favor of presumed epistemic privilege. While this is an important insight, this accusation begins to look absurd if prodded at much depth. First, a key impulse driving discourse concerning the voice of nature is greater democratic representation and ethical consideration. For instance, Leopold's view of an expanded ethical community goes hand in hand with his famous reflections about "thinking like a mountain": "after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view" (1949, 122). Here Leopold, through an intimate, powerful experience with wild nature claims to discern in some capacity the thoughts and thus "voice" of nature, revealing that all its elements, including wolves, are ethical subjects.

Second, particularly in its Thoreauvian manifestations, access to "the language which all things and events speak without metaphor" is available to all and is thus radically democratic, more so in fact

[67] One example to which I will return in the last chapter is the sublime of which Edward Mooney reflects: "In the current academic climate, the sublime has become an object of dispraise or suspicion. An interest in the overpowering or vast…is a cover, so it's argued, for projects of domination and violence" (2009, 60).

than any other pillar of the polis. In this rendering, it may be masked however, if only sometimes deliberately, by a variety of human artifices.

Third, nature as a non-political foundation is a powerful antidote to totalitarian impulses, whether political or technical. Just as technocracy has a totalizing impulse, partly as the product of an inescapable scientism, so too has the political as an intellectual category colonized every form of discourse and every crevice of the globe (in analysis). Utterly suppressing political analysis is obviously authoritarian, but so too is a totalizing, inescapable "political". Simplistically stated, pointing towards politics as an antidote to technocracy may simply replace scientism with politicism, defined in one instance as "the view that all human endeavors are power struggles. Thus, according to Michel Foucault[68], even art would be cultivated for the sake of power" (Bunge, 2001, 145). This eliminates the possibility of nature as a robust, non-political category that, as often seen in Thoreau's writings, provides a critical point of resistance towards injustice and tyranny[69]. Political analysis is better understood as a lens that can be applied like so many others, thus surely there ought to be opportunities to take it off? Surely there is room for a poetical ecology.

Finally, this accusation conflates two (nevertheless related) forms of technocracy: the first neglects the political, the second the poetic. More often, in academic writing at least, the latter sits somewhere between neglect and suspicion. Incorporating the political into discourse is thought to be a

[68] An interesting aside – Foucault had a "definite distaste" for nature: "Foucault and Verdeaux, whom he referred to as 'my wife,' also visited Binswanger during his vacation in Ticino, in the southern Alps, on the shore of Lake Maggiore. The two colleagues met in Florence and, after spending a few days in Venice, took a car to reach the psychiatrist's summer residence, visiting churches and museums along the way. 'He loved painting,' Verdeaux recalled of Foucault. 'He is the one who made me understand Masaccio's frescoes in Florence.' On the other hand, she remembers equally well that Foucault detested nature. Whenever she showed him some magnificent landscape—a lake sparkling in the sunlight—he made a great show of walking off toward the road, saying, 'My back is turned to it.' They spent a few days with Binswanger…They talked about Heidegger…" (Eribon, 1991, 66). This means that a great deal of the subdiscipline of political ecology works from the theories of a thinker utterly disengaged from and disdainful of wild nature. This is important.

[69] "I cannot persuade myself that I do not dwell wholly within hell…What confirmation of our hopes is in the fragrance of this flower! I shall not so soon despair of the world for it, notwithstanding slavery, and the cowardice and want of principle of Northern men…It reminds me that Nature has been partner to no Missouri Compromise. I scent no compromise in the fragrance of the water-lily" (Thoreau, 1854a, 346).

welcome and entirely sufficient antidote to technocracy, reflected for instance in this comment: "fisheries management in a democracy is fundamentally a political activity rather than a technical one" (Wilson, 2009, 29). This however misses an element of environmental management that is not reducible to power relations.

Critical thinkers of various stripes, including Andrew Feenberg and Murray Bookchin, attribute the technocratic mathematization of the world primarily to capitalism, suggesting that much of Heidegger's analysis can be collapsed into one of political economy. One prominent, recent example of this is Jason Moore's *Capitalism in the Web of Life.* Echoing Heidegger, Jason describes "the scientific and symbolic creation of nature in its modern form, as something that could be mapped, abstracted, quantified and otherwise subjected to linear control," necessitating planetary surveillance by remote sensing and globalized standardization via measurement[70], mapping, and conversion to a common metric of exchange in global economic systems (Moore, 2015, 86).

Contrary to Heidegger, he attributes this global technical management not to the epochal development of technical revealing but to "the core of the capitalist project" (Moore, 2015). Heidegger instead draws our attention to (but ultimately away from) metaphysics, hence his statement that capitalism and communism are metaphysically equivalent (1961). Heidegger's analysis of technology may certainly be incomplete, but attribution to capitalism seems only to beg the question—why is capitalism as it is?

Andrew Feenberg similarly calls for a "technical democracy" in which "design would be consciously oriented toward politically legitimated human values rather than subject to the whims of profit-making organizations and military bureaucracies. These values would be installed in the technical disciplines themselves" (2010, 81). Moore's analysis like Feenberg's solution, are, in my view of

[70] Especially the metric system–removed even from prior systems of more sensual and bodily standards, such as a foot or bushel (Moore, 2015).

technocracy, insufficient. In part because political calculation of power and privilege may be its own mathematical a priori. Poetics is indispensable. Poetics may in fact be an antidote to a totalizing politics that in part creates the conditions for technocracy[71].

Antidemocratic, authoritarian accusations leveled against "speaking for nature" are well intended as an affirmation of democracy but are anthropocentric and technological at root and may even incorporate an inherent violence toward wild nature insofar as implicit in these accusations is an assumption that nature is in itself voiceless and meaningless, thus here only for us to give it meaning and ultimately to reshape it according to our whims. This aspect within the wider possibilities of poetics is only antidemocratic if nature is assumed to have no voice or one not worth representing (or perhaps impossible to represent).

Feenberg does sympathize with Marcuse's attempts to join "technical and aesthetic insight" in order to reform technology "in accordance with 'the laws of beauty.'" This would be possible by appealing to life-affirming values "recognized in experience" and rooted in an "eroticized sensuousness" (qtd. in Feenberg, 2010, 203). But anything approaching a Thoreauvian sense of nature as thoroughly alive and meaningful, much less sentient, is dismissed by Feenberg as a "regressive re-enchantment of nature" (2010, 209). Feenberg's and Moore's solutions, contrary to Heidegger, are ultimately social and political—sociological rather than ontological. "The thing" recedes. In my view, technical democratization is necessary, but not sufficient. There remains a lingering need for representation of wild nature rendered, however imperfectly, through poetics.

Politics aside, the epistemological question remains: what can it mean to know nature's voice? David Abram taps Merleau-Ponty to provide one promising answer. Language is often assumed to be an

[71] "The threat to the planet's survival looms large. Has there ever been a better excuse for intrusion? New areas of intervention open up, *nature becomes a domain of politics*, and a new breed of technocrats feels the vocation to steer growth along the edge of the abyss" (qtd. in Schmidt & Marratto, 2008, 56, emphasis added).

exclusively human possession. Deep cultural assumptions rather than "careful and judicious reasoning" have given us "a strange inability to clearly perceive other animals—a real inability to clearly see, or focus upon, anything outside the realm of human technology, or to hear as meaningful anything other than human speech" (Abram, 1997, 25). Abram instead offers this provocative alternative: "If language is born of our carnal participation in a world that already speaks to us at the most immediate level of sensory experience, then language does not belong to humankind but to the sensible world of which we are but a part" (Abram, 1988, 117).

Through his phenomenology of embodied perception, Merleau-Ponty reveals perception to be "a sort of conversation, carried on underneath our spoken discourse, between the living body and its world" (Abram, 1988, 101), while Merleau-Ponty's thought, unique from perhaps any other western philosopher, seeks to ground language in this embodied perception (Abram, 1988, 116). Language, in Abram's view, thus "has its real genesis in the deep world of untamed perception" (Abram, 1988, 118) in a "silent conversation…far below…verbal awareness" (Abram, 1997, 52). We are participatorily engaged in the living world prior to the emergence of speech and thought; engagement is thus the bedrock for both. The voice of nature is in this view nonverbal and communicated at the level of bodily gesture, which can later bubble up into words. There is thus no substantive fissure between human and nonhuman communication and the epistemological question evaporates. The poetry of the world is understood at the level of embodied engagement. Poetics is the world's flesh—technics what is left after its flaying[72].

The precedence of poetics over a technics epitomized by modern science is justified because the sensory world grounds and "predates" the mathematical—the foundation of science, speech, and

[72] This is admittedly an imperfect metaphor. I do not mean to imply that underneath the world of experience lies the real world as measured and assessed by the sciences—the Galilean position in other words.

thought is lived experience. And because, according to Heidegger, modern thought brings an a priori mathematical that blocks and challenges the world's revealing and thus, to extrapolate from Heidegger a bit, the world's voice.

David Abram gives one compelling answer to the epistemic question but fully accepting his portrayal of an animistic world is not required to acknowledge the significance of poetics as I have described it. One possible alternative is a pragmatic approach or a "skeptical poetics" that withholds judgement about the voice of nature—taking this way of speaking as merely metaphorical—but nevertheless seeks to constantly refer words to their sensory grounding in direct experience of nature—to nail "words to their primitive senses…transplanted…to [the] page with earth adhering to their roots" (Thoreau, 1862). This could take the form of texts informed by "référance" in a three-step process of "(1) reaching a self-reflexive acknowledgment of the limits of language, (2) referring one's perceptions beyond the printed page to nature, to the referential origin of all language, and (3) in most cases achieving an atonement or at-one-ment with nature" (Gilcrest, 2002, 136).

It is not necessary to presume that language can fully convey the wild immensity of the living world. There may always remain "a surplus that escapes our categories"—a wildness that resists full domestication by words (Bennett, 1994, xxi). Thoreau understood this when he remarked that "so vast is the disproportion of the told to the untold" (1849). There very well may be something always beyond rendering in language, but this does not mean we cannot have some "intelligence with the earth": "Shall I not have intelligence with the earth? Am I not partly leaves and vegetable mould myself?" (Thoreau, 1854, 134).

Ultimately this poetic perception restores the place of language, allowing a "wild meaning" to be found in our experience of nature: "In a sense the whole of philosophy…consists in restoring a power to signify, a birth of meaning, or a wild meaning" (Ponty, 1968). After this restoration of wild meaning, there remains a proper place within poetics for politics—a democratic poetics where the products of

poetic participation with place may be tested publicly. Politics however need not fully possess every portrayal of place.

Chapter Six: The Poetics of Environmental Management and Design – Part Two: From Wildlands Management to Planetary Design

Figure 9: Managing Planet Earth

"The 1992 United Nations Conference on Environment and Development document, *Agenda 21*, for example...took it for granted that the global environmental problem was one of management." —Schmidt & Marratto (2008)

"Poetry is one of the best ways that people have to bring the Earthly into language. This does not occur through an apparent representation but through a truth factor that is irreducible to the calculus of science or governmentality."
—Michael Peters & Ruth Irwin (2002)

In the last chapter I addressed the theoretical underpinnings and full significance of poetics. I now return to the practical dimensions of poetics as relevant to design and management.

Beyond Naturalness

"Thus a paradox has emerged: now and in the future, only natural areas with lots of human help will continue to look and function the way they did hundreds of years ago; land that is truly allowed to 'go wild' will change in unpredictable ways. Suddenly the vacant lot in Detroit is wilder than Yellowstone."
—Emma Marris (2015)

Wildlands management has reached an inflection point due to a variety of immense changes, particularly invasive species and climate change, leading specialists to declare that "some of the sacred tenets of park and wilderness management" need to be questioned (Cole & Yung, 2010, xi). Naturalness is the most prominent causality of these sacred tenets, earning its way into the title of an influential collection of essays on the subject: *Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change*.

Naturalness or "natural conditions" is a fundamental principle in U.S. protected area legislation and policy, found everywhere from the National Park Service Organic Act of 1916 to the Wilderness Act of 1964. The problem is that naturalness has disparate meanings, which rapid environmental change has placed into conflict with one another. Naturalness is often taken to mean one of three things: 1) a

pristine condition without human impact or effect of any sort (lack of human impact), 2) "freedom from *intentional* human control" so that nature can be self-willed and autonomous (lack of human control), or 3) historical fidelity in the sense of retaining the same characteristics (e.g. structure and function) as in the past (Yung, et. al., 2010, 254).

However, while at one time the diverse meanings of natural "were considered to be congruent (by most protected area managers, at least)," they are now increasingly in conflict (Aplet & Cole, 2010, 13). The simplest illustration of this is the conundrum presented by the presence of an invasive species in a protected area. As a species accidentally introduced by humans, it violates the first and third senses of naturalness (pristine and historical fidelity). Actively working to extirpate it to counter inadvertent human impact so as to maintain the third sense (historical fidelity) would however violate the second (autonomous), while the third (pristine) is already lost. There is thus no management action (or inaction) that can simultaneously maintain all three meanings. This is the "dilemma of wilderness management"—the "recognition that maintaining ecosystem composition and function increasingly entails asserting human control" necessitating that the "formerly congruent meanings of naturalness are conceptually split" (Aplet & Cole, 2010, 21).

Another significant dimension to this dilemma is increasing unpredictability and unprecedented departure from past conditions. Past ecological states cannot be salvaged and are rapidly receding in the rear-view mirror. They cannot thus provide a guide for present and future management actions. The future consists instead of "no-analog habitats" in "an era in which environmental influences on ecosystems have no precedence in the history of Earth, no matter how far into the past we look" (Stephenson, et. al. 58).

Managers must continue to make decisions and plan despite losing tethers with the past, and in the face of competing management goals, a lack of scientific consensus (Chapin, et. al., 2010, 217), and an uncertain future full of inevitable surprises in which "most management strategies, sooner or later,

will not work as planned" (Doak et al., 2008, 958). This may require abandoning "traditional approaches to long-term planning that are based on the assumption that the future is known, or at least knowable" (Stephenson, et. al., 2010, 63). These challenges are accompanied by a variety of new ecological understandings that also flout "traditional" management approaches, including nature as dynamic and in flux rather than in balance, accounting for the role of people in shaping ecosystems, and incorporating the crucial role of large-scale landscape connectivity (Hobbs, et. al., 2010, 38).

This dilemma has spurred a massive conceptual reevaluation of the purpose and practicalities of protected areas ranging from positing new management goals to reexamining the role of science in protected area management. There are now a range of possible management goals with no clear and necessary criteria to decide between them.

Historic management goals like the maintenance of a mere façade of naturalness for visitors (as described in the foundational Park Service document—The Leopold Report); the "original humanistic goals" of nostalgia, monumentalism, and a romantic landscape vision (Cole, et. al., 2010, 126); and now naturalness, are all taken less seriously than outcomes driven by ecological science. New, more acceptable possibilities include a modified, more flexible understanding of historical fidelity as compositional, structural, and functional similarity to past ecosystems found in a given place (Cole, et. al., 2010, 128), or ecological resilience.

One alternative however is to double down and pick a management objective that still fits as much as possible within the paradigm of modern science and management, providing unambiguous, measurable, and precisely defined management objectives (Woodley, 2010, 114). Ecological integrity has been posited as fulfilling these mandates. Parks Canada gives this definition: "with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes" (qtd. in Woodley, 2010, 109-10).

Another is to turn away from positivist, modernist standards based on "rules and rigid protocols," "reductive and frequentist approaches," and "faith in…technical knowledge" towards "alternative and integrative" or "more subjective" and flexible approaches and techniques that deliberately integrate human values, politics, local expertise, and qualitative aspects. What is needed, in other words, is the fostering of a new scientific humility (Yung, et. al., 2010, 265; Landres, 2010, 94). Despite these new possibilities, *Beyond Naturalness* posits that in the face of rapid change and uncertainty, ecological intervention is likely to become increasingly pervasive (Yung, et. al., 2010, 253).

One management alternative however stands out against what is otherwise portrayed as a fated future of heavy manipulation. Ecologist Peter Landres posits the possibility of a "hands-off approach" in at least some protected areas in deliberate contrast to the dominant command and control paradigm of land management. While human impact may be inescapable, some places can nevertheless be spared from intentional manipulation. This is an important distinction—between intentional manipulation and unintentional influence by external sources. Wild or untrammeled nature can still exist with the latter; it need only "be free from intentional manipulation, not…from human influence" (2010, 99).

Landres's option challenges not only dominant paradigms of land management but necessitates reconsidering the role of science. Rather than "remake nature according to biological theory," we are challenged to instead "accept the wild" (Turner, 1996, 125). This necessitates developing "a science of letting things be" (Willers, 1992, 605) founded on scientific humility and a requisite management approach that has no predetermined goals. This is an uphill battle against an institutional culture in which both scientists and managers are deeply enthralled by a sense that "doing something is better than nothing" fueled partly by a concern with the risk and liability of inaction (Landres, 2010, 99).

There is another important relevant distinction in addition to that between intentional manipulation and human influence: between the impacts of modern and nonmodern people. The term

"modern" is never used explicitly in any foundational legislative document establishing National Parks or Wilderness in the U.S., for instance the Organic Act of 1916 or the Wilderness Act of 1964. However, in Australia, "legislation stipulates that it is only the effects of 'modern technology' or 'modern society' that are inconsistent with wilderness" (Aplet & Cole, 2010, 19). The U.S. Wilderness Act may also imply such a distinction in its use of "man", e.g., "in contrast with those areas where man and his works dominate the landscape" (1964), substantiated by multiple references by the Act's author Howard Zahniser to "modern man" in other contexts.

Landres however relies on the term to, for instance, emphasize the previous distinction, by insisting that hands-off areas should be free of even the "good intentions of modern people" (2010, 95). It is also used heavily in the U.S. Wilderness management document*, Keeping it Wild 2*, for instance, to define wilderness character as "a holistic concept based on the interaction of (1) biophysical environments primarily free from *modern* human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of *modern* society" (Landres, et. al., 2015 2, 7, emphasis added), and to define untrammeled and natural as "essentially unhindered and free from the intentional actions of *modern* human control or manipulation" and "substantially free from the effects of *modern* civilization," respectively (Landres, et. al., 2015 2, 10, emphasis added).

This distinction may mainly be a shorthand for (pre)historic impacts and surviving traces of humans, which are deemed to be consistent with wilderness character, and contemporary impacts, which are not. This may simply hinge on the increased power of technology held by contemporary humans: "some have sought to define naturalness [by] distinguishing temporally between early human influence, when technologies were less sophisticated and less of a threat to nature, and more recent human influence" (Aplet & Cole, 2010, 19).

To recap, I have just presented two primary distinctions, between inadvertent impacts and intentional manipulations, and between modern and nonmodern impacts and manipulations. What

however meaningfully differentiates 1) deliberate contemporary human intervention from 2) historic manipulation and 3) unintentional external effects? The difference between 1 and 3 is obviously intentionality, while that between 1 and 2 is modern. There are a few ways modern and nonmodern could be differentiated (none of these are meant to be a valuation implying better or worse and I am certain this list is incomplete):

1) Social organization: degree and type of interconnectedness, epitomized in our era perhaps by the modern bureaucratic state.
2) Power of landscape modification: historic use of fire for instance was powerful, but incomparable to bioengineering, helicopter delivery of hatchery fish to mountain lakes, delivering beetles from halfway across the globe to combat invasive species, etc.
3) Materiality: metal, plastic and other synthetic materials as opposed to animal and wood products, stone, etc., and the requisite noise impacts that mechanization produces.
4) Metabolic/psychic rift (from locale): epitomized perhaps in the hypothetical ability to live in a given location and rely on food and energy from somewhere else entirely, something that would have been impossible until recently[73].
5) Ontology: a fundamental sense of belonging (or separation) from the nonhuman world or that the nonhuman consists of sentient personhood (or mechanical processes), for instance.
6) Technological/mathematical revealing of nature: in modern thought, things are "skipped over" and thus disappear, accessible instead only as manipulable resources awaiting transformation and command. The hallmarks of modernity for Heidegger are the mathematical and "representational" thinking, which portrays the "world as picture" (Heidegger, 1968; 1977a).

[73] Interestingly, backcountry camping is a sort of metabolic cocoon, utilizing food and fuel brought on one's person, not derived from one's immediate environment. Though some areas allow and are more suited for open fires and recreational hunting, fishing, and gathering.

It is the last (#6), which singularly differentiates modernity from past epochs according to Heidegger, and which I discussed at length in Chapter 3. The quality and quantity of technology in its material manifestation, including the increased power of manipulation and control it gives, is clearly important, but is merely symptomatic in Heidegger's analysis. Furthermore, most of these factors that distinguish modern from nonmodern are likely to persist long into the future barring significant social collapse (nor would we necessarily wish them otherwise). Some can be addressed if only indirectly and imperfectly by policy, for instance the Wilderness Act's restriction on mechanization. What can be fruitfully considered is the nature of management and design in relation to Heidegger's assessment of modernity.

I return here to a differentiation I first made in Chapter 2 between four ways of knowing nature, which are in turn actualized in management: "Cowboy Biology," Technical, Poetic, and Traditional Ecological Knowledge (TEK). A cursory look at the recent political atmosphere, particularly in the U.S., reveals that the "cowboy" approach is alive and well. The descriptions provided in *Beyond Naturalness* paint a picture of a modern technical management approach that has been dominant but is generally accepted to need revision, perhaps creating space for the poetic, which would generally be understood to fall into the category of "more subjective approaches." The modern / nonmodern differentiation meanwhile cries out for more analysis in relation to TEK, which has grown in popularity in the last few decades as a fruitful addendum (at least) to modern science.

Before I consider TEK, I will first further consider the relationship between Technical and "Cowboy" knowing in the context of wildlands management. *Beyond Naturalness* consistently reaffirms this portrayal of a predominantly technical management approach as opposed to a "cowboy" approach where managers do "what they think is right" without justification or technical standards:

> Compared with those of the past, today's park and wilderness managers are held to much higher standards regarding how they make management decisions. Doing what they think is right, without justifying what they are doing and why, is no longer acceptable. Instead, before acting, planners and managers must describe objectives, desired future conditions, and the outcomes of management actions in as specific terms as possible (Cole & Yung, 2010, xi).

In this portrayal, rigorous, scientifically informed planning sets objectives that can then be continually assessed via technical monitoring.

Monitoring is defined in this context as "the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective" (Woodley, 2010, 114), while planning is "a process of identifying a desired future and determining the pathway (or set of pathways) to it" (McCool et. al., 2007, 3). Planning in particular, at least as an ideal, is cast as a predominantly technical enterprise: "Park and wilderness planning is usually based on a rational comprehensive model that assumes agreement on objectives, scientific certainty, and the availability of data to support a decision" (Chapin, et. al., 2010, 217), or again, what is referred to in *Beyond Naturalness* as "traditional planning" (but I have been subsuming under technical) "privileges technical experts and efficient, predictable decision processes" (Chapin, et. al., 2010, 218).

Similar portrayals of contemporary wildlands management are given by Fikret Berkes in *Sacred Ecology* in contrast to TEK: "the positivist–reductionist approach has dominated conventional resource management and conservation thinking" (Berkes, 2018, 285), and again, resource managers "were not only the technocrats who knew how to calculate quantitative targets, but they were also the high priests of the positivist–reductionist paradigm. These managers rejected traditional knowledge and management systems because they did not fit with the paradigm" (Berkes, 2018, 286). Other studies have reaffirmed this "technical bias," for instance in USFS management: "In recent decades, advancements in science have required management agencies to incorporate increasingly technical factors into their management decisions" (Anderson, et. al., 2013, 2).

It would thus seem that the "cowboy" approach that defined Yellowstone management in post-war America is no longer prevalent in contemporary wildlands management. There are however a variety of studies that have arrived at very different conclusions. Some powerful instances include:

- "there is empirical evidence that most conservation and management decisions are not based on scientific evidence"[74] (Merkle, et. al., 2019, 1645)
- "some studies suggest limited use of scientific information by governments in policy- and decision-making"[75] (Soomai, 2017, 2)
- "Conservation practice reportedly suffers from low use of technical information"[76] (Jacobson, et. al., 2013, 221)
- Or these stark statistics specific to conservation management:
    - "90% of decisions are made without an evidence base" (Jacobson, et. al., 221)
    - "only 2.4% of management decisions incorporated scientific evidence" (though this is higher in planning) (Jacobson, et. al., 221)

What could this disparity in assessment mean? Is the status quo of technical management described in *Beyond Naturalness* a rosy self-portrait, a mere description of ideals? This must be at least part of the story as many of the authors do seem to lament the good old days when things were simpler and the ideal of scientifically guided technical management held up before the uncertainty of rapid change set in. This does appear to be their ideal form of management even if perhaps never fully realized in practice.

There is likely more to the story though. Perhaps it is because the world has already plunged into uncertainty and managers are self-consciously aware of the more limited role of science. Or perhaps there is a lack of effective communication between practitioners and academics as some of the articles with the unflattering statistics mentioned above move on to suggest. It is not my intent to solve

[74] The author then cites these studies: Pullin et al. 2004, Sutherland et al. 2004, Cook et al. 2010, Artelle et al. 2018
[75] The author then cites these studies: Cossarini, MacDonald, & Wells, 2014; Dicks, Walsh, & Sutherland, 2014; Holmes & Clark, 2008; Holmes & Savgard, 2008; McNie, 2007; Soomai, MacDonald, & Wells, 2013; Wells, 2003.
[76] The author then cites these studies: Gibbons and others 2008; Hanley 1994; Rogers 1998; Roux and others 2006; Smythe and others 1996; Sunderland and others 2009; Cook and others (2010)

this riddle. Likely the answer is somewhere in between: actual management practice lies in the spectrum between "Cowboy Biology" and Technical management, each problematic in its own way.

There is a pressing need to move beyond this spectrum. Luckily, there are promising new directions to investigate. I have thus far provided a robust analysis of poetics but have only hinted at how it relates directly to management, contextualizing it for instance in architectural design. Before I do this, however, I will now take up an important precedent that I have up until now mostly neglected: traditional ecological knowledge.

Traditional Ecological Stewardship

Indigenous management of wildlands is important to consider not only as an alternative to technical management but practically for its outsized role in global conservation:

> Indigenous Peoples manage or have tenure rights over at least ~38 million km^2 in 87 countries or politically distinct areas on all inhabited continents. This represents over a quarter of the world's land surface, and intersects about 40% of all terrestrial protected areas and ecologically intact landscapes (for example, boreal and tropical primary forests, savannas and marshes) (Garnett, et. al., 2018).

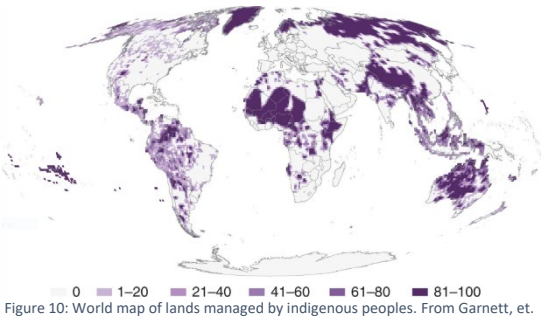

Figure 10: World map of lands managed by indigenous peoples. From Garnett, et. al., 2018

"Management" is a useful shorthand to describe the tending of land and its inhabitants by indigenous peoples, aspects of which are shared between state agencies and indigenous peoples. It is however simultaneously a problematic portrayal of the relationship that indigenous peoples have with these places. Fikret Berkes, for instance, observes that "many indigenous languages do not even have words for 'resource' or 'management'" (2018, 20). The term itself is coupled too closely to technical management, or what Berkes calls "modern management systems," rooted ultimately in Newtonian science (2018, 31). Management thus implies passive, controllable nature without sentience—ideas

foreign and anathema to the outlook of the world's indigenous peoples (I do believe we can make certain, limited generalizations about indigenous beliefs and practices as a whole[77]).

Indigenous peoples are instead more likely to "talk about 'caring for country,' 'taking care of the land,' or 'keeping the land'" (Sherman, et. al., 2010, 44). Animals and land are understood to have agency and sentience and must thus be related to rather than manipulated. Connection, responsibility, and meaning are more apt terms in this context than management and governance (Berkes, 2018, 33). Though Berkes employs the phrase "traditional management systems," Richard Sherman of the Ogalala Sioux has instead suggested the term stewardship: "Lakota people consistently replaced the term 'management' with the concept of 'stewardship', implying a duty of care, accountability, and spiritual obligation toward nature" (Sherman, 2010, 147).

The "traditional" component of traditional ecological knowledge is also not without its drawbacks. It could be construed to imply stasis—a set of beliefs and practices locked in time. Indigenous beliefs and practices have however evolved over time and will continue to do so. Many of the terms regarding indigenous peoples and land are contested and it is not my intent to thoroughly summarize nor resolve these debates. "Traditional ecological knowledge," whatever its flaws, is a widely accepted descriptor of the knowledge and beliefs of indigenous peoples and I thus use it here. Stemming from this, I use traditional ecological stewardship to refer to the management practices of indigenous peoples, following Sherman's suggestion to employ the term stewardship rather than management. For simplicity, I will often refer to TEK below as inclusive of both knowledge and stewardship.

[77] "Traditional management systems pose a paradox. On the one hand, they are characterized by an extraordinary similarity of basic designs shared by different cultures in different geographic areas in comparable ecosystems…On the other hand, they are characterized by a remarkable diversity in practice, even in adjacent areas" (Berkes, 2018, 293).

Traditional ecological knowledge and stewardship have received ample academic attention over the last few decades. Interested readers can thus refer to the abundant literature on this topic. My intent here is to make a few simple points to illustrate my primary purpose to assess and offer fruitful alternatives to technics.

TEK and modern science are in certain ways compatible and in others quite incompatible. My primary contention is that modern science is preeminently technological, while TEK is not. I am not saying here that indigenous people have not invented and employed sophisticated and awe-inspiring tools and techniques to survive and thrive over millennia. I am saying that TEK is not technological in the ways Heidegger identifies: it is neither projective, calculative, nor experimental. This difference should not be overlooked[78].

Many commendable attempts have been made to integrate TEK into scientific analysis or management, for instance Inuit observations of climate change in the Arctic to supplement instrumental measurement and modeling. Many indigenous knowledge scholars have however pointed out the danger of doing so, namely that TEK can itself become a resource to be mined—funneled through the sieve of modern thought—hence the fitting phrase "data mining."

This can occur when TEK is pulled out of its cultural moorings and local context and "scientized"—converted for instance into quantitative format or graphs. In the process "stories, values, and social relations that transmute…animals from a set of population figures into sentient members of the social, moral, meaning-filled universe of the hunters 'drops out of the database' as irrelevant" (Nadasdy, 2007, 13). Julie Cruikshank describes this "idea that a measurable natural world might be

[78] Technological theorist Neil Postman usefully distinguishes between tool use and technology, where a tool has a specific aim that exists within a cultural context, whereas technology colonizes culture, resulting in a technocracy rather than a tool-using culture: "In a technocracy, tools play a central role in the thought-world of the culture. Everything must give way, in some degree to their development. The social and symbolic worlds become increasingly subject to the requirements of that development. Tools are not integrated into the culture; they attack the culture. They bid to *become* the culture" (1992, 28).

pried from its cultural moorings" as a "touchstone of Western rationality" (Cruikshank, 2014, 245)—a process Feenberg calls primary instrumentation.

TEK is more closely compatible with "alternative post-positivist approaches in environmental management," which seemed to be called for in *Beyond Naturalness*. This would include adaptive management (Holling, 1978), for instance, "in which uncertainty and surprises are an integral part of the anticipated set of responses" (Berkes, 2018, 290). Berkes suggests that…

> Adaptive Management is a good match for traditional ecological knowledge, and a potential bridge between Western and indigenous ways of knowing in the area of ecology and resource management. It is part of the holistic tradition in Western science—not the mainstream tradition, but significant nonetheless (Berkes, 2018, 290).

Berkes is right to draw a parallel between TEK and "the holistic tradition in Western science"—a parallel that is often overlooked. I will however return to this point later.

Another obvious dichotomy between modern management systems and traditional management stewardship is monitoring. While the former has "traditionally" treated monitoring as a technical procedure, which relies on quantitative measures, the latter operates very differently. Inuit people, for instance, "do not attach much value to numerical precision…[and] do not often make simple causal connections," such that "systematic generalizations regarding cause–effect relationships are in general avoided and considered 'childish'" (Berkes, 2018, 221).

The Cree, likewise, in the cases of both caribou and fisheries, utilize what Berkes describes as a synoptic qualitative mental model to easily, rapidly, and non-intrusively assess population size, animal health over time, and overall relationships with land, relying "mainly on contextual information [and] the reading of environmental signals" (Berkes, 2018, 152). Indigenous peoples, in other words, have long employed "dataless" management, which, operates "not by using numerically precise data, but by using language-based data that are qualitative and rich"—"practical data" that emerges through everyday interactions (Berkes, 2018, 221).

Once again, TEK converges with the "post-positivist" approaches called for in *Beyond Naturalness*:

> A common impediment to monitoring is the all-or-nothing perception that monitoring must be complex and precise to be useful. Monitoring should be simple, flexible, consistent, and spatially extensive, but it need not always be precise, complex, or comprehensive (in variables measured, design, or statistical robustness). It can often be qualitative and opportunistic" (Chapin, et. al., 2010, 220).

Berkes is careful to point out however that the monitoring utilized by indigenous peoples is not necessarily a substitute for that founded upon modern science, and that in fact these may be complementary.

Despite these convergences and complementarities, a question emerges if "monitoring" like "management" is not already so yoked to modern science that it is at its core an inherently technical term? What for instance is the difference between monitoring and surveillance? Monitoring and spending time on the land? Or knowing a place intimately? There are important insights into this quandary in the disparate approaches of Adolph Murie and the Craigheads: Adolph's approach seems to deliberately inoculate the latent technical tendencies associated with monitoring in its embodied intimacy, something lost in the methodologies of the Craigheads, which are structured around employing "gadgetry" to surveil. Speaking in the terms of monitoring may, like the scientizing and data mining of TEK, lead to a loss of what Berkes calls the "transformative potential" of either place or place-based knowledge (2018, 17).

Science, and therefore scientific management, is not independent of culture. This is one of the key insights of science and technology studies (and of the Goethian Ideal). This does not however mean, contrary to some in the discipline, that scientific information is merely constructed without substantive grounding in a nonsocial realm. One powerful example of the cultural dimension of wildlands management, including in its technical aspect, is found in anthropologist Paul Nadasdy's essay *We Don't Hunt Animals, We Kill Them*. His analysis reveals, among other things, the rootedness of technical

management in a longstanding agrarian tradition that vastly predates modern science. Nadasdy's essay also resonates with anthropologist Tim Ingold's characterization of differing conceptions of hunting as "a technical manipulation of the natural world" in "western" (what I call modern) thought versus "a kind of interpersonal dialogue" by indigenous peoples (Ingold, 2000, 49).

Nadasdy considers the relationship that the Kluane First Nation in southwest Yukon, Canada has with the State of Canada regarding wildlife management. He observes that North American wildlife management relies strongly on an agricultural "metaphor" including terms essential to the cultivation of crops and domestic livestock such as *harvest, stock, transplant, husbandry, seed*, *and yield* (Nadasdy, 2011, 135). This agrarian tradition is however foreign to Yukon First Nations who do not readily relate to these ways of speaking about, relating to, and ultimately managing wildlife. They instead understand animals as "other-than-human-persons" with whom one must maintain reciprocal social relations through ritual and respect (Nadasdy, 2011, 142). Their primary objection to the agrarian metaphor is its presumption of ownership and control (Nadasdy, 2011, 138). These differing views of animals has had practical implications: for instance, the Kluane objected to a wolf sterilization program on this basis.

TEK is experiential rather than empirical. It begins with "the things themselves." Experimentation may occur, but it is a part rather than apart from everyday experience and practical involvement in the world. Tim Ingold rightly ties this knowing with ecological management:

> Knowledge born of [the immediate experience of sensory participation with human and non-human components of the dwelt-in world], though commonly dismissed as 'intuitive,' must necessarily form the bedrock for any system of regulation or management that would treat the environment as the object of its concern (Ingold, 2000, 13).

Focusing particularly on the Ojibwe of northern Canada, Ingold builds upon Heidegger to explain the significance that places have for many indigenous hunter-gatherers—a "poetics of dwelling" or "poetic involvement"—the results of an "attentive engagement with the environment" manifested in both poetics in the more typical sense of storytelling or songs, but also in the physical engagement

necessitated by traditional lifeways. Resounding with the ec-static potentialities of Thoreau, Goethe, and Heidegger, such poetic involvement can become so intense as to move from outward appearances to a point where "the boundaries between person and place, or between the self and the landscape, dissolve altogether" (Ingold, 2000, 56).

The analyses provided by Berkes, Ingold, and others frame traditional ecological stewardship in direct contrast to modern management and in opposition to many of the same aspects of technology and modernity identified by Heidegger. Traditional ecological stewardship may also be understood as a variant of wildlands management that strongly integrates the poetic in Heidegger's sense of incorporating a preservative attentiveness to nature's spontaneous unfolding. It is also knowing in the fullest sense of being at home in something—wherein the practical and theoretical collapse into each other.

TEK is fully appropriate in some management settings—especially the large portions of the globe where indigenous people are the primary caretakers. TEK may also fruitfully interact with modern science, though this necessitates a degree of scientific humility. Beyond these contexts involving TEK, there have been other approaches providing new directions for moving beyond the paradigm of modern science and technology, and responsive to the paradox of managing wildlands. A strong current has been to begin to think in the terms of design. Such design must somehow refrain from remaking "nature according to biological theory" or any other a priori projection of certainty. I now turn to this possibility.

Design

"The virtue I have been calling design is still struggling to be born."
—Albert Borgmann (2007)

"The further removed men are from animals…the more their effect on nature assumes the character of premeditated, planned action directed towards definite preconceived ends."
—Friedrich Engels (1934)

Design is increasingly crucial to the fate of both the nonhuman world and that of ourselves. This is just beginning to fully dawn on environmental philosophers, conservation practitioners, and those focused on solving climate change and other global environmental issues. There are clear characteristics of good and bad design. Above all, bad design is technocratic in both senses identified above: contrary either to the demands of democracy or poetics. I provide here a few considerations of design to move beyond its latent technocratic potential.

Wild Design

The necessity of design has in a sense been foisted upon humanity by pervasive and unintentional impacts on the biosphere and the requisite need to intelligently act. This is a point to which I will return. Ecological restoration theorist Eric Higgs makes a similar observation in the specific context of conservation. He identifies one possible fissure in the paradox of managing wildlands—the possibility of successfully navigating the tension between the wildness of unrestrained processes and intentional human intervention in the form of design—a possibility he calls wild design (Higgs & Hobbs, 2010, 235).

Higgs defines design as "the intention and planning behind any action" (Higgs & Hobbs, 2010, 235). He challenges managers to acknowledge that design is already occurring through everyday interventions—that "all interventions are designs" (Cole & Yung, 2010, 250). This necessitates a critical evaluation of interventions to ensure they are performed intelligently and ethically. Wild design is

ethical intervention insofar as it deliberately recognizes and supports “free-flowing ecological processes” (Higgs & Hobbs, 2010, 235).

Higgs anticipates the technocratic threat (though he never uses the term) by calling for public participation and acknowledging the risk of “superficiality” (what might be called simplification), which “can accompany design practice” (Higgs & Hobbs, 2010, 246). This risk “originates in the professionalization of design and the tendency to create prescribed and formalized rules, procedures, and design grammars…guidelines [that] could provide a rigid cookie-cutter approach to intervention” (Higgs & Hobbs, 2010, 246-7). This is reminiscent of the warnings given by Dean Hawkes above regarding architectural design—that relying on technics alone can reduce design to “a mere mechanical art” and result in “reductive codification and specialization” (Hawkes, 2019, xi).

This superficiality can be overcome in several ways. First, by recognizing the relevance of design to both process and product—the desired goal and how it is implemented. Second, by recognizing that wild design sits at the intersection of knowledge and intervention as a practice. Higgs thus rightly leaves a place in wild design for a “broader suite of ecological knowledge” to include not only science, but TEK, literature, and art (Higgs & Hobbes, 2010, 237). Third, Higgs (like Landres) calls for humility based on an awareness of “ecosystems as open evolving systems that in many cases are more complex than we can readily understand” (Higgs & Hobbes, 2010, 246)—also hearkening back to the analysis given in Chapter 1 of modern ethics failure to account for system complexity.

Finally, Higgs notes that “the antidote for superficiality is depth”—achieved in large part by “ensuring that a primary professional obligation of designers is nurturing engagement” (Higgs & Hobbes, 2010, 247). Higgs gives seven principles but insists that “if there is a single principle that warrants the greatest attention for managers of protected areas, it is engagement,” defined as “the strong reciprocal tie people form with ecosystems [physically and emotionally] through first-hand experience” (250, 243). Higgs sees both a political benefit to engaging the public in restoration and intervention on public lands,

but also what I interpret to be a very similar insight to Dean Hawkes: by acknowledging the role for a wider array of knowledge than science, and the possibility of first-hand experience to overcome reductive and procedural approaches, and perhaps to also instill humility, Higgs (though never using the term), points towards a poetics of design in conservation management and restoration.

Engagement as Higgs portrays it centers on human connection to place. This is an important aspect of poetics, but more limited in its scope than some thinkers have posited. Higgs's description of the role of engagement in wild design may resonate with ecologist Stephan Harding's call (following Goethe) for the necessity of spending ample time with a place to "allow the situation to live itself into the imagination through the medium of the senses" before making environmental management decisions (2007, 532). It however stops short of Merleau Ponty (at least as interpreted by David Abram), in recognizing that engagement involves two-way communication rather than simply human connection.

Stages of Design

"The issue is not, however, whether the earth will be engineered by the human species: that has been and is already occurring. The issue is whether humans will do so rationally, intelligently, and ethically."
—Braden Allenby (ESEM, 2000, 24)

"There also is a big difference between a premeditated and an inadvertent change. We may have inadvertently affected much of the world through pollution, the accidental introduction of nonnative species, and climate change, but we have not yet set about intentionally shaping the whole planet. We have not yet made this choice, and it does not appear that we are compelled to do so."
–Christopher Preston (2018)

Following Higgs's insight, it is possible to recognize that design is already occurring in conservation, even when unrecognized as such. Once way to begin to recognize this is to lay out the progress of design over time in relation to formally protected wildlands. The progress of these levels also happens to correspond with an increasingly technological aspect (or at least the greater risk of technical dominance). This is admittedly a simplistic rendering.

The first stage is the design-ation of protected areas in response to widespread development, mechanization, or habitat loss. This was the earliest stage of design historically and may also be the simplest form of design (at least in its historic manifestations)—simply draw a line around a place on a map and give it a name.

The second is the actual management of a protected area. This is the sum of policies enacted and interventions that occur, the latter of which Higgs has above already equated with design. From the first through the second stage, inadvertent impacts—often from sources extrinsic to protected areas—may have accrued. Many historic management strategies were however also highly impactful.

The third is a more intensive process of design that has historically followed the first two in its range of implementation: restoration. Restoration is a more evident form of design as human intention and planning is prominent. Restoration has been dismissed by some as inescapably technological[79], though Higgs has attempted to provide a more nuanced position.

The last is ecological engineering. I include this as the last as it is the most explicitly coupled to technology. Though often related to restoration and management, ecological engineering may include ecotechnology, synthetic ecology, or bioengineering to accomplish its ends. By one prominent account, ecological engineering relies on "mathematical optimization models" (Straškraba, 1993, 311).

It is important to note that each level may increase in technical exactitude independently of the others. For instance, though design-ation may be the earliest stage historically, and its historical manifestations the simplest form of design, it has now become a highly technical process in many cases. One such instance is the use of algorithms to identify conservation priorities in the Greater Yellowstone region:

> Using an algorithm that included analysis of vulnerability and irreplaceability, areas were proposed for conservation that would most contribute to the four overall regional conservation goals. Th[is] algorithm also took into consideration the compactness of selected areas to maximize connectivity (White, et. al., 209).

[79] E.g. Eric Katz (2009).

Designation has thus shifted, from what was historically based on a romantic vision of landscapes, for instance, what I described in Chapter 2 as John Muir's experiential exaltation of the beautiful and the sublime as cornerstones of preservation, to a technical operation.

This sequence of stages of design, though unique to wildlands conservation, has parallels in other environmental contexts. Climate change for instance has followed (or may follow) this path:

Natural atmosphere prior to pollution → Atmosphere impacted by greenhouse gas emissions → Collective agreements to mitigate impacts by limiting emissions or protecting carbon sinks like forests (~= designation / management)

→ Active restorative measures such as reforestation and carbon capture (~= restoration)

→ Engineering (geo-, eco-, etc.).

To be very clear, this sequence of stages is not inevitable. The climate need never be subjected to geoengineering, but if that occurs it will likely follow this sequence. Each stage entails a qualitative and quantitative shift in intervention. Intervention is the deliberate exertion of human will in natural processes—a "coming-between" nature and its autonomous inclinations—even when those processes may already be restricted by inadvertent impacts. Philosopher Christopher Preston has drawn attention to this shift from inadvertent impact to deliberate design as substantial and morally significant (2018). Three stages of design can be derived from Preston's analysis:

1) Natural Wild – This applies in the case of wildlands management to lands prior to designation or protected areas in which the three meanings of naturalness—lack of modern human impact, lack of intentional human control, or historical fidelity—are still unified; in the case of climate change, this refers to a global atmosphere essentially unhindered by anthropogenic greenhouse gas emissions.
2) Unintentional Collective Degradation – This applies in the case of wildlands management to either widespread habitat loss or increasing mechanization (particularly road intrusion) leading

to designation (a form of design itself), or extrinsic impacts, particularly localized effects of climate change, pervasive pollutants, and invasive species following designation, which ultimately causes the three meanings of naturalness to split; in the case of climate change, this refers primarily to rampant anthropogenic greenhouse gas emissions and deforestation.

3) Deliberate Design – In the case of wildlands management, this is either management interventions, restoration, or ecological engineering, and hybrid approaches such as wild design; in the case of climate change, this refers to active restorative measures or geoengineering.

These stages are not fixed in this order or for all times and places. There may continue to be, for instance, places free from design, where a deliberately hands-off management approach is adopted despite extrinsic anthropogenic forces. Unintentional collective degradation and unpredictability may persist despite our best efforts at design. Or an anticipated degradation might be headed off by design. These stages nevertheless outline a strong general trend in the evolution of the contemporary human relationship with nature.

It is not possible to go back to the first stage in the cases of wildlands and climate change, while the second is obviously undesirable in most circumstances. This situates us firmly in stage three. Design must therefore somehow integrate the wild, but in a new way that forms a relationship. The wild must pass through our intentionality.

Arctic wilderness specialist Roger Kaye asks this relevant question about the use of the term "untrammeled" in the Wilderness Act: "why not define Wilderness as an area that is simply wild? After all, by definition, an area that is untrammeled is wild" (Kaye, 2018, 8). His answer is that…

> 'untrammeled by man' refers to more than the landscape condition of ecological and evolutionary freedom that is wildness. At heart, *Untrammeled* is the inter-relational dimension of Wilderness. It's also about *us*, how we relate to the natural world and its other inhabitants, and who we become when we find it within ourselves to allow some of it this freedom from our willfulness…Untrammeled is a relationship of respect for the autonomous creativity of unwilled processes…a most genuine relationship of humility and restraint (Kaye, 2018, 13).

Kaye's characterization situates this conversion of wildness into a relational context at the designation stage (in its later manifestation in the Wilderness Act at least). Untrammeled represents this new condition[80].

If the unintentional degradation of the second stage is not sufficiently addressed, the wild may be lost through outright destruction, but the third stage presents an equally large challenge: improper design in which technics dominates risks converting the wild into a technical object—a product of engineering. I am not referring here merely to an unexpected or undesired outcome that is a result of confusion between, for instance, ecological and engineering resilience, but the wholesale neglect of an aspect of nature that cannot be known by modern science. To prevent this, the tools and methods of modern science must be directed by poetics—a poetics of design in which "the measurable is only the servant of the unmeasurable."

All interventions are not created equal, nor is all intentionality. Technics and poetics flow out of distinct foundations and thus manifest in different ways of intending. This can be conceived as a gradient of intentionality from the unintentional to the technical. Lack of human intention is found both in the wildness that vastly predates our intentionality and in the unrestrained degradation wrought by our own devices. Technics is a hard approach that attempts, with varying success perhaps in the face of immense complexity, to reduce nature to the calculable and controllable and act upon nature in accordance with this vision. Poetics rests somewhere in between: by directing attention toward nature's spontaneous unfurling, experienced through embodied sensation and engagement, and integrating this into design, poetics brings "the wildness that vastly predates our intentionality" into contemporary design meant to curb or undo anthropogenic environmental destruction. There is a deliberatelessness in

[80] A more recent account has defined wildness (essentially equated with untrammeled) in relational terms: "wildness is best understood as a relationship of control between a person and the world" (Lee, et. al., 2021, 4).

poetics—a way in which the world—the "voice" of wild nature—can insert itself into design by seizing the embodied imagination of the designer.

This will likely manifest in practice in one of two ways: in guiding the design process; and in creating space for an intuitive, holistic sense of things and places allowing for "a reconciliation of self and world"—an integration of what might be called sacredness: a sense of integrity and meaningfulness in things that is not a mere projection of human capriciousness. In the case of Muir this led to flawed conservation strategies. Poetics in this sense is nevertheless necessary, but it is not sufficient.

Practical Poetics

Drawing upon Goethe and others, Stephan Harding applies what he calls holistic science to environmental technology management. By the latter, he has in mind large-scale engineering ventures such as massive water redistribution projects or geoengineering. Responding to the growing recognition of uncertainty in complex systems as well as the ongoing environmental destruction often exacerbated by advertent technological interventions, Harding calls for solutions "that mimic nature's own ways of problem solving" (2007, 531) and a revision of the process of scientific inquiry leading up to technological intervention, whereby "careful attention is paid to the phenomenon being studied through a process of active looking without attempting to reduce the experience to quantities or explanations" (2007, 528).

Recalling Oliver Sacks's romantic science in the context of medicine, Harding likens the process of understanding an environmental issue and formulating solutions to that of medicine: a good doctor picks "up on subtle cues such as skin colour, body posture and tone of voice" that allow for the development of "intuitive insights into the underlying causes of the physical symptoms" (2007, 532). Unlike a typical clinical approach, however, problems should be addressed not by detached experts but by "groups of practitioners, working consensually" (2007, 532). Ample time and close interaction are

crucial so that practitioners can begin to identify with the problem, allowing "the situation to live itself into the imagination through the medium of the senses" (2007, 532). Practitioners should aim to develop…

> a 'conversation' with the situation by means of careful note-taking, talking to local people, drawing, walking, visualizing and, if appropriate, sleeping out in the field, but without at this stage being overly influenced by the promptings of the thinking mind. The aim is to clarify perception to such an extent that a genuine connection is forged between situation and practitioners so that pre-conceived notions involving standard 'textbook' technologies are not allowed to obscure any culturally and ecologically sustainable solutions that might otherwise emerge from the local context. In this way intuition is given the chance to suggest how to best deploy whatever technologies might be appropriate (Harding, 2007, 532).

Harding seeks to reform the design process so that technics—what he calls "technical excellence"—is contextualized—directed—by an "experience of the world as a whole"—the foundation of poetics in my rendering, though he never uses the term. Thoreau and Humboldt, following Goethe, each sought such experience prior to moving out of immediate experience into the detached formality of scientific inquiry (though their scientific endeavors never result in the degree of detachment of the Newtonian-Galilean mode of inquiry).

It is hard to find anything approximating Harding's suggestion in contemporary management practice. While it would seem to nest neatly within *Beyond Naturalness's* call for "more subjective approaches" (though Harding, Heidegger, Goethe, and I would object to this characterization), the actual example given in the text is scenario planning—undoubtedly useful, but hardly Goethian science. This does however create a foothold—a resurrection perhaps of the indispensable footfall of Adolph Murie's shoe-leather study, which looks, in retrospect, strikingly like Harding's characterization of proper scientific inquiry.

Field philosopher Robert Frodeman provides a useful analysis of Arches National Park's visitor experience program from 1989 that further reveals the deficiency of contemporary approaches in light of the necessity and possibilities of practical poetics. In a typical management setting, social science—of

a rather dry and stringent variety—is the closest land management agencies get to integrating experience into decision making. Frodeman notes that Arches NP management focused on…

> issues such as the carrying capacity of the land and how trail overuse can damage the vegetation and the soil along the shoulders of park roads. Tellingly, while the importance of "visitor experience" is noted, the Park Service does not analyze the term, and certainly doesn't discuss the aesthetic and theological motivations that motivate many of the Park's visitors. Once again, aesthetic or theological concerns have been translated into the language of science or economics (2003, 133).

Experience has, in other words, been simplified and rationalized into technics. However valuable such studies may be for informing park management, they are nevertheless incomplete. This is ironic given the wildly experiential origins of the National Park system in the character of John Muir.

Frodeman's insights here are important; however, his use of the term "theological" is unfortunate. Though reminiscent of the evocations of a key figure in the origins of the national parks—John Muir's "glacial gospel" and his reference to natural spaces as cathedrals for instance[81]—"theological" is literally the study of God, thus threatening to suck Frodeman's important observations into the vortex of thorny issues at the intersection of faith and politics, the separation of church and state not least among them.

Frodeman does not however seem to have God or established religion in mind. He instead equates theology (and "geotheology") with a sense of the sacred that "match[es] the intuitions that we dare not voice" in serious public debate—intuition contrary to "modernism's account of a dead and purposeless universe"—including a deep sense that ravaging the earth is wrong, which need not be grounded on the dictates of reason and in fact precedes codification into ethics (2003, 132+40).

It is thus really the sacred that Frodeman has in mind—something he describes as "more elemental and intuitive" than religion, which "implies the centrality of the notion of care" (2003, 55). The sacred relies on language and intuitive insights marginalized, not only in management decision

[81] And of Heidegger's evocation of "gods" in his fourfold. Heidegger obviously had no connection to the formation of the U.S. national parks.

making, but in environmental ethics. Frodeman seeks to find a place for the sacred in both[82]. I will return to the latter consideration in the final chapter. Attentiveness to experience may open a place for the sacred in discourse and management, but poetics is a more expansive concept than the sacred.

Narrative more fully personifies poetics than the forms of communication typically found in science and management. I discussed in the last chapter how Oliver Sacks utilizes what he calls clinical tales as a component of romantic science in response to cold clinical portrayals of living people. Narrative can instead convey singularity, contingency, relations of care, and the fullness of experience. Narrative is therefore one potent way to contextualize environmental management and technological intervention. The wilderness character narrative, when executed properly, comes closer than any other widely used management strategy that I am aware of in fulfilling the promise of practical poetics.

From Management to Design

"Traditional management education has been widely criticized for an overemphasis on rational, analytic, arms-length approaches to the detriment of softer, more intuitive capacities. Most critics agree that today's management students are overdrilled in the routines of calculation and analysis, but underprepared for the dynamic and turbulent settings in which managers often find themselves."
—Van Buskirk, et. al. (2017)

The connection of management to design is only hinted at in Higgs when he, for instance, points out that although "design is anathema to most protected area managers…the evolution of design from

[82] It is noteworthy and more than coincidental that one of the preeminent texts on traditional ecological knowledge is titled *Sacred Ecology*. Berkes's use of the term is strongly reminiscent of Frodeman's: the sacred is contrary to reductionist ecology, implies unity between humans and environment, and involves care. Berkes's concern is however almost exclusively with indigenous knowledge and thought. There are many aspects of traditional ecological stewardship that exemplify practical poetics.

There is, I believe, a widespread mutual misunderstanding (oversight) between TEK literature and continental philosophy of science and technology following in a tradition of broadly romantic thought stretching back to Goethe. Within this latter tradition, many attempts have been made to diagnose and mend the same issues that Berkes recognizes, including Habermas's identification of the "severance of spheres," Weber's diagnosis of disenchantment, Goethe's delicate empiricism, and Heidegger's prognoses of science and technology, and many more. TEK advocates and Indigenous Studies scholars often miss the detailed history of western philosophy, which has led to a widespread skepticism of tradition, the sacred, and associated concepts. There is, granted, often an acknowledgment by anthropologists and TEK scholars that "Western" and "Indigenous" are oversimplified categories.

In the other direction, the philosophy and history of science (as well as other academic disciplines) miss (or dismiss) longstanding oral traditions, which embody solutions to the problems identified by these disciplines, including simplification, resourcification, and the severance of spheres. Berkes for instance refers to the Dene concept of "head and heart together" and the Maori concept of "science with a heart" as contrary to western science (though he does mention that certain axioms of indigenous thought and "post-positivist" science converge) (2018, 289).

built structures to complex systems provides an opportunity for ecologists and protected area managers to undertake a deliberate, systematic, and ethically grounded approach to intervention" (Higgs & Hobbs, 2010, 235-6). And again, when he describes wild design as "a framework in which to fit a wide variety of contemporary and emerging management challenges" (Higgs & Hobbs, 2010, 235).

More systematic efforts have however been undertaken by others, often in response to some of the same shortcomings of "modern management systems" including increasing uncertainty and a stifling analytic approach that suppresses intuition and the full possibilities of creativity. In the context of management and business education, one response given by Van Buskirk, et. al., whose quote opens this section, has been to introduce students to poetry in order to "wake up capacities for intuitive thinking, implicit knowledge, emotional engagement, cultural sensitivity, creative problem solving, and a knack for envisioning new possibilities" (Van Buskirk, et. al., 2017, 399).

Another has been to shift emphasis from management to design. Typical management education has focused on "advanced analytical techniques for choosing among alternatives"—tools such as "economic analysis, risk assessment, multiple criteria decision making, [and] simulation" (Boland & Collopy, 2004, 2-3). Because these presume relative certainty of outcomes and posit management decision making as a choice between multiple definite alternatives or "an assumption that the alternative courses of action are ready at hand," this has been referred to by the contributors to *Managing as Designing* as a "decision attitude" (Boland & Collopy, 2004, 3).

In comparison, a "design attitude" imagines novel possibilities, questioning the very representation of problems. Shifting towards management as design acknowledges that "the familiar vocabulary of management brings premature closure to problem solving" (Boland & Collopy, 2004, 9). This closure in typical management approaches has led to "a self-perpetuating cycle of mediocrity" due to an analytic approach oriented toward efficiency and around set alternatives (Boland & Collopy, 2004,

5). Managers must instead "operate in a problem space that has no firm basis for judging one problem-solving move as superior to another" (Boland & Collopy, 2004, 9).

A design attitude moves beyond a modern, analytic approach, yet the authors who utilize the term occupy an awkward position between these dominant approaches and new possibilities. They seem wedded to modern aspirations when they, for instance, define design as "the science of decision making" whose ultimate goal is to "put better ideas and alternatives on the table for analytic consideration and quantitative assessment" (Boland & Collopy, 2004, 5+8). However, they do acknowledge the importance of individual human experience rather than abstraction in design, while pointing towards alternatives that resonate with *Beyond Naturalness*'s call for "more subjective approaches." They suggest for instance "sketching, mapping, and storytelling," while characterizing design as "a deeply humanistic and intellectual activity that can keep the design problem in a more liquid state" (Boland & Collopy, 2004, 9).

Managing as Designing provides important contributions towards understanding the contemporary management context and further perspectives on how to move beyond modern management systems. The authors rightfully identify a potentially important contribution of management as design to be imagining new alternatives rather than simply choosing among preset options; however, this again falls short of the potential of practical poetics. Poetics may well contribute towards envisioning new possibilities, but in contextualizing technics, including the analytical approach of the decision attitude, poetics is also crucial in decision making. Poetics leaves a place for sensual experience to inform intuition and "live itself into the imagination" thereby directly informing decision making.

An orientation towards design in a management setting is posited both here and by Eric Higgs in the works I have thus far discussed. The importance of design—or at least contemplating the limits and possibilities of design—in a global context has been addressed by philosophers Christopher Preston,

whom I have already considered, and Albert Borgmann, whom I considered in Chapter 1 and will now briefly return to.

Borgmann calls for a reexamination of design as a political virtue, incorporating both justice and stewardship. Design is a creative enterprise that must also respond to Winston Churchill's observation that "we shape our buildings, and afterwards our buildings shape us"—what Borgmann calls Churchill's Principle. It must thus incorporate the "moral and cultural quality of our lives" (Borgmann, 2007, 130). Design therefore has a moral significance: "the shape of public space channels our moral conduct. The virtue of design comes to taking responsibility for how we shape what we have in common" (Borgmann, 2007, 179). Public spaces and material culture may enable or discourage practices that lead to individual excellence. For instance, incorporating spaces for exercise, limiting exposure to certain classes of chemicals, and increasing access to wholesome food into the planning of cities may combat obesity. It is also necessary to direct our attention towards public spaces that have hitherto escaped sufficient consideration, the global atmosphere above all.

"Design" has connotations in both the technical and poetic realms: mathematically oriented engineering is a form of design as are the products of artists and artisans. In both senses, and in most instances, including those I have included in this chapter, design is oriented around human needs and wants. Borgmann, for instance, is primarily concerned with human excellence and well-being, while *Managing as Designing* at one point identifies design with "the creation of practical, effective products that serve human beings in all aspects of their lives" (Boland & Collopy, 2004, 2), and architect Dean Hawkes, with whom I began the last chapter, at one point equates poetics with "the complex sensory experience that we enjoy in buildings" (2019, xvi).

There is thus a key breakdown in my use of design analysis from architecture, civic space, and business management. Eric Higgs, in addressing restoration and wildlands management, is the primary exception to this rule as he attempts to formulate a set of design principles that "supports" the wild.

Christopher Preston is correct to point out that we are not compelled to design, particularly because "in a number of places, nature still operates largely independently of human intent," places where "our species' role remains negligible" (2018, 101). But in many instances, including the global atmosphere, design is the preferable alternative to wanton destruction and neglect.

I, like Higgs, have attempted to navigate between human intention and nature's autonomy. My position in short is that orienting design (as management) towards poetics, as I have described it, is a necessary component of this navigation. Poetic design points beyond the technical towards sensory experience of the world's presence and thus leaves room for the integration of wildness into design. Some places are however best left free of design even when already (or potentially) subjected to the indirect influences of large-scale design. The design of the earth is only partly for us.

Planetary Management

> "The evolution of human technological competency in nanotechnology, biotechnology, and other emerging capabilities, potentially subjects the entire material world, including the biological world (which of course also includes the human itself, both physically and cognitively), to human design." —Braden Allenby and Daniel Sarewitz (2011)

> "It may be possible to reinvent the Enlightenment—to move away from the concrete toward the inchoate, from the delusion of dominance and control to the thoughtful and reflective embrace of humility and tentativeness." —Braden Allenby and Daniel Sarewitz (2011)

The recognition of design as a new political virtue and as a needed corrective to wanton environmental destruction carries significant risks: the earth may be understood merely as a technological artifact that must therefore be technocratically managed. This was precisely the perspective of engineering professor and former vice president of AT&T Braden Allenby in his initial presentation of earth systems engineering and management (ESEM) in 2000, which he defined as "the capability to rationally engineer and manage human technology systems and related elements of natural

systems in such a way as to provide the requisite functionality while facilitating the active management of strongly coupled natural systems" (Allenby, 2000, 15).

Allenby's presentation of ESEM has evolved since 2000. Initially, he made brash statements claiming that "in short, the earth has become a human artifact" (2000, 11), while he emphasized rationality, functionality, and active management. His initial positions were thus so characterized: "Allenby urges us to dismiss…romantic ideals, and replace them with functional measures of nature's utility and with rational environmental management" (2000, 26). And again: "ESEM is essentially a proposal for planetary governance built from a project-engineering mold" (Keith, 2000, 27).

At that time, he neglected the distinction between intentional and unintentional environmental modification seized on by Preston and Landres. Contrary to Allenby's 2000 position, they recognize that the world is not an engineering artifact simply because it is touched by human effects, and human impact does not therefore justify applying engineering methods to every corner of the globe. To be fair, Allenby does stipulate even in 2000 that intervention should only occur as necessary, while he acknowledges the intersection of ESEM with culture, ethics, and even religion. His was never a shallow technocracy. There is nevertheless a deep technocratic seed buried in ESEM.

Allenby has matured in his outlook since then. He and other proponents of earth systems engineering and management now provide caveats, warnings, and emphasize more deeply the need for humility; but ultimately, he still approaches the world as a project engineer, albeit one who is uncannily aware of its ungraspable complexity. This is evident in his more recent works. The *Techno-Human Condition*, for instance, while a brilliant analysis of technology, is conspicuously missing real concern with wildness, even as manifested in the human body, from which its much broader analysis of technology begins. Eleven principles are provided to successfully move forward in this new technological setting, but nothing akin to a necessity for poetics including an immersive sensuous contact with nature

nor anything responsive to nature's self-emergence is among them. He (and Sarewitz) calls for a softer Enlightenment but does not grapple with the romantic challenge to Enlightenment ideals.

In a 2019 article considering the design of infrastructure in the Anthropocene, Allenby (and others) explicitly address the intersection of wildlife and infrastructure, including the example of Northwest U.S. fisheries and dams. Yet, the principles given are to design for adaptive capacity and complexity, not for wildness (Chester, et. al., 2019). Despite the substantial evolution of his critical analysis of technology, a basic naivety underlies ESEM and its associated developments, including Allenby's general assessment of technology. A statement from his initial work on ESEM continues to reverberate throughout his thinking: "Technology is the means by which human cultures interact with the physical, chemical, and biological world" (Allenby, 2000, 11). Technology is not however the only, or even primary, means of interaction humans have with the natural world, nor can this interaction be limited to the world as presented by the sciences. Herein lies the seed of technocracy.

On the other hand, complexity and uncertainty feature prominently throughout his works. These are in fact important aspects of wildness. Christopher Preston for instance portrays wildness as a fundamental unpredictability that will persist even in the event of ubiquitous design: "The physical world is filled with elements of unpredictability that get baked into the things we build. Even the best-constructed artifact retains just a little bit of wildness that forever has the potential to come back and haunt us" (2018, 32). This alone is however a shallow sense of wildness. Wildness is not merely the absence of a certain pedigree of predictable order, but a positive dimension of nature with its own emergent order—a meaningful expression of immanent bounteous will—purposeful movement towards the fulfilment of an insatiable internal drive—the ceaseless expansion of life—the cutting edge of existence.

The ubiquity of anthropogenic environmental impacts rises along with the risk of profound environmental catastrophe. Climate change is rightly regularly described as an "existential" threat to humanity. However, nearly 70 years ago, Heidegger identified what he considered an equally pernicious existential threat—that technology would "lay waste" humanity regardless of whether it resulted in our destruction by nuclear annihilation or some other means: "The threat to man does not come in the first instance from the potentially lethal machines and apparatus of technology" (1977b).

This threat is that technology would conceal the world's essential unfolding—poiesis—thereby allowing a forgetting of the wildness that resides in the world and in ourselves. Thoreau, in famously declaring that "in wildness is the preservation of the world," and noting that "men have become the tools of their tools" (1854, 36), gives a parallel prognosis of "the danger." In Thoreau's reckoning, human culture and physical well-being are dependent on the uncultivated and our engagement with it. In its absence is left only "a civilization destined to have a speedy limit" (1862).

I gave the example in Chapter 2 of the human relationship with ice, considering how certain ways of speaking and thinking about glaciers and ice—as watertowers or reservoirs, for instance—"set things up" for technical management in contrast to the revelatory vision of John Muir or the social ontology of glaciers that "listen, pay attention, and respond to human behavior" (Cruikshank, 2014, 25).

Anthropologist Julie Cruikshank notes that Muir "spoke a language of sentience that must have surprised his Tlingit hosts": "He described glaciers as 'traveling animals that make their own tracks,' and as 'crawling through gorge and valley like monster glittering serpents.' He spoke of glaciers 'in labor' giving birth to mountains, and of falling icebergs emitting 'the outcry of a newborn berg'" (Cruikshank, 2014, 158). Muir's poetic vision of nature in fact resonated deeply enough with indigenous residents of southeast Alaska to inspire Chilkat chief Dan-na-wuk to say the following of Muir (at least according to Muir):

> It has always seemed to me that while trying to speak to traders and those seeking gold mines that it was like speaking to a person across a broad stream that was running over fast stones and

> making so loud a noise that scarce a single word could be heard. But now, for the first time, the Indian and the white man are on the same side of the river, eye to eye, heart to heart (Muir, 1915).

I evoked ice in this context as a potent symbol of our evolving relationship with the earth. Our mundane daily lives (those of us in developed countries particularly) now have a disproportionate and obvious impact on the furthest, most inaccessible reaches of the earth—glaciers and ice sheets in Greenland, Antarctica, and at the heights of the Himalayas unequivocally "respond to human behavior"—our temperate, arid, and tropical lives—even at their most suburban—are now deeply icy. Glaciers pour their bodies into the seas, transforming currents, creeping into coastal megalopolises, thereby imperiling our own bodies.

It is tempting to respond to this as Allenby did by calling for planetary engineering based on the insights of modern science, extending the Army Corps of Engineer's vision of Greenland's ice sheet to the planet as a whole—based on an understanding of ice as "an equation to be solved" (O'Reilly, 2017); or equally perniciously, opening the floodgates to technological intervention by managing the earth according to the hyper-modern visions of Haraway-ian cyborg destinies—a vision nicely compatible, whether intentionally or not, with bleached skies and mountain ranges choked with dams rather than crowned with glacial ice.

Planetary management and design needs instead the flush of lyric testimony to place, "the dream of great and common people alike." We must allow wildness to surge into our plans, to rise above the reduced vision of nature as utility, to melt our fantasies of rational control and mathematical planning. The efforts by wildlands managers to integrate wildness into management and design offers a hard-won and hopeful starting place that may have applications towards planetary management. Whatever the scope, however, poetics needs a central place in design.

What is finally needed is an ethic, which, like the variants of knowing and design I have discussed in the last several chapters, begins with wild nature, and is not simply an extension of modern thought expanded and applied to wild nature. This will be the subject of my final chapter.

Chapter Seven: The Need for Wild Ethics

"What I have learned of the pond is not less true in ethics."
—H.D. Thoreau (1854)

"Listen rather…to the voice of the healthy body: that is a more honest and purer voice…and it speaks of the meaning of the earth." —Friedrich Nietzsche (1883)

In the first chapter, I provided ten failings of modern theoretical ethics[83] and a synopsis that modern ethics, like modern thinking in general, shares a common essence insofar as Galilean-Newtonian physics prevails as the epitome of explanation: in modern ethics as in modern science, the true and the good are understood as fundamentally lawlike and algorithmic. I expanded upon this characterization of modern thought in Chapter 3 focused on modern science and technocracy. My position in short is that modern thinking is problematic because it is inherently technocratic.

In the first chapter, I also outlined three types of ethics, following Albert Borgmann's synopsis: 1) Theoretical, 2) Applied/Practical, and 3) Real; and mentioned an alternative canon of lyric or personal philosophy identified by Edward Mooney. The concern of this chapter is to lay the groundwork for a fourth type of ethics: wild ethics. This alternative canon along with real ethics are both important foundations for wild ethics. Like real ethics, the concern of wild ethics is the moral makeup of the material world, following the basic insight of "Churchill's Principle." It differs however in that its primary concern is with the wild—both human and nonhuman. And like lyric philosophy, poetic style and attentive engagement are integral to wild ethics—the way something is said or spoken about matters.

[83] As a reminder, the ten failings I address in the first chapter are:

1) Failure to account for excellence and the good life (technology 1)
2) Failure to account for the material conditions of everyday life (technology 2)
3) Failure to substantively restrain technological development (technology 3)
4) Failure to overcome "methodological reason" and technological thinking (technology 4)
5) Failure to overcome abstraction and detachment in favor of the personal and transformative (technology 5)
6) Failure in the face of systems level uncertainty (technology 6)
7) Failure to overcome essentially modern thinking: modern ethics is experimental, rather than experiential (technology 7)
8) Failure to overcome critical-constructionist thought (technology 8)
9) Failure to be useful in everyday decision making
10) Failure to substantively engage with the concrete and empirical

This is precisely a rejection of the style and approach of dominant analytic forms of philosophical environmental ethics, thus cannot so easily be assessed according to its dictates. Wild ethics departs from mainstream (modern theoretical) ethics in three fundamental respects:

1) In recognizing that the divisions between ethics, epistemology, ontology, and lyric expression, whether orally or in literature, are artificial and detrimental in important respects. This is a departure not only from mainstream ethics, but from dominant manifestations of science and epistemology.
2) In recognizing that ethics is embedded in lifeways, traditions, experiences, and engagements: systematic, philosophical ethics has a place, but it is narrower than often portrayed.
3) In recognizing that the abstract, impersonal style of philosophical ethics is deficient, and that this is morally relevant. A lack of substantive engagement with the wild world leads to a lack of evocation. Places and things are thus not sufficiently represented. What is needed instead is a poetic, lyrical style, found in thinkers like Thoreau and in many oral traditions.

In sum, wild ethics fundamentally recognizes that environmental ethics and philosophy, like management and design, needs a foundation of poetics upon which to rest. In a sense then, the term "ethics" betrays the core of wild ethics since it implies that the good is best derived by technical inquiry.

Precedents

"Wild ethics" has two main precedents. First, from David Abram, who founded The Alliance for Wild Ethics, and authored a short article on the topic. Second, Edward Mooney attributes a variant of wild ethics to Thoreau in *Thoreau's Wild Ethics*, wherein he provides an explication more formal than

ever given by Thoreau himself. I will first summarize Abram's and Mooney's accounts of wild ethics before building upon them as I outline my own set of characteristics[84].

David Abram's Wild Ethics

Abram's reflections are brief, but important. He seeks to shift the focus of ethics from "a set of rules or principles for right conduct" to a simple humility and an attentive openness (2017, 1). His concern is thus more with our sense of the world and the implications this has for our relationship with it. In this rendering, it is not possible to have proper a relationship with anything that is assumed to be passive and determinate. This is true not only of other human beings, but the entirety of the living world that surrounds us. It is instead necessary to put abstractions and preconceptions aside to experience the world as open-ended, spontaneous, and agentic.

There is ambiguity and mystery in everything. Acknowledging this enables us to cultivate humility and wonder, what Abram calls "the exuberant heart of a wild ethics." Rather than a sense of obligations or duties, we will be equipped with "empathic attunement" and "compassionate intention." Returning to our bodily senses allows us to shift from a "faith only for a mystery assumed to reside entirely beyond the sensuous" to "an older, indigenous faith" in the predictable presence of things as revealed by our senses—"the ground of every lasting ethic between persons, and between peoples" (Abram, 2017, 2).

Since written language has, in Abram's view, been instrumental in turning us away from our senses, he describes the purpose of the Alliance for Wild Ethics as "the rejuvenation of oral culture (the culture of face-to-face and face-to-place storytelling) as an ecological imperative" (Abram, 2017, 1).

[84] Philosopher Martin Drenthen also happens to briefly mention "an emerging new 'wildness ethic'" in one of his articles (2007, 394).

Ethics, like "human creativity and craft, when practiced in attentive, participatory attunement with the local earth, can also be deeply wild" (2021).

Thoreau's Wild Ethics

In contrast to the widespread professionalization, specialization, and balkanization of contemporary academia, Mooney situates Thoreau's thinking in the tradition of "moral philosophy on a grand scale"—or "Great Moral Theory," including the likes of Nietzsche, William James, and a variety of ancients—a tradition in which many of its luminaries "lived outside and against the academy, whose warrens they found divisive and stifling" (Mooney, 2011, 106).

Thoreau's ethics is wild in three main respects. First, Thoreau lived and wrote in untamed landscapes: from Maine to Cape Cod to Walden Pond "among tangled plants and spirited animals, bequeathing a wilderness ethic whose watchword is attentive, responsive care" (Mooney, 2011, 107). Mooney also includes human disaster and political crisis in his catchment of the wild—each of which is featured in Thoreau's writings: "Thoreau gives us ethics responsive to nature's heartless indifference, ethics engaged in the wild of political crisis, ethics nurtured in landscapes where humans do not have the upper hand" (Mooney, 2011, 107).

Second, "the wild has taken root within and become characteristic of his consciousness… Wildness has invaded him; he is a wilderness" (Mooney, 2011, 107). Mooney has in mind here Thoreau's grappling with the traumas of life—the "destabilizing contingencies" of ethical life—his brother's sudden death for instance—forming "a gap or wound characteristic of human subjectivity most generally"—an awareness of the distance between what is and what could be—forging a soul "wild like a river's torrent" (Mooney, 2011, 108). Wildness is this inner rupture, necessitating new moral growth. The self, like the wild world around it to which it is connected, is in ceaseless flux and development.

Third, Thoreau's wild ethics avoids domestication by system, working instead from a "plurality of angles and moods…a weave of multiple strands, only loosely interlaced" as opposed to the "abstract and monocular" efforts of typical school-taught ethics that seek "simplicity of focus" (Mooney, 2011, 108). Thoreau "is not out to retrieve a holy grail in the shape of a 'formula' for living well" (Mooney, 2011, 115).

Mooney draws here on Charles Taylor's contrast of ethical thought as metaphorically placed in academic corrals, open meadows, and forests, representing "three flowingly connected regions of discourse, comportment, and intelligibility" (Mooney, 2011, 108). Corrals are the "place" of codes, laws, and forensic debate, where the language of duties, obligations, and regulatory principles like justice reign—taking place in the ivory tower, the courtroom, wood-paneled offices, or the armchair.

In meadows, argumentation and systematic ethics recede, and the imagination is free to roam through ethical terrain. Ethics appears instead as orientation and sensibility, manifesting in a sensitivity to the need to cultivate virtues and excellence, particularities move into focus, and "we find what amounts to an ethical-aesthetics or embodied vision, the allure of a way of being" (Mooney, 2011, 109).

Finally, the forest is a place of struggle and revelation, tragedy and serenity, "where meaning and morale are in peril"—a place of existential, bordering on religious concerns. Thoreau wanders across each of these ethical realms, at times providing sustained argument, at times considering character and excellence, and at times staring into the abyss, alert to wonder and terror.

Thoreau's ethics is experiential and reflexive, shifting "scales and modes of perception" of things and places, thus renewing our sense of wonder and creating inwardly felt "imperatives to see and hear more, to respond and become better, in this quite particular situation. Such felt imperatives do not derive from theory or from a fanciful system 'any rational mind' ought to accept" (Mooney, 2011, 118).

I showed in Chapter 4 that Thoreau, much like Goethe and Humboldt, struggles with the emergence of modern science, including a severance of art, morals, and science. He thus envisages a unique approach akin to Goethean science he refers to as Sympathy with Intelligence. This is an immersive, sensorially-based, rigorous, yet nonmethodical, way of knowing, which draws on the experience of nature as a moral foundation. Thoreau's way of knowing and his wild ethics are thus inseparable.

Wild ethics follows a lineage of thought and practice with many precedents united by a thread of active receptivity and poetic involvement in nonhuman nature via coupled moral and scientific endeavors. While there might be other branches, I identify the following as a primary lineage: Goethe – Alexander von Humboldt – H.D. Thoreau – John Muir – Aldo Leopold – Adolph Murie[85]. Each are exemplars, blurring barriers between ethics, epistemology, ontology, and lyric expression. It is also possible to draw strong parallels with indigenous traditions, with utterly disparate lineages, an aspect I take up in the final characteristic of wild ethics.

I assessed the role of science and technology in the management of wild nature in the last two chapters. Humanity has been thrust, often inadvertently, into the role of intermediary in many evolutionary processes. The application of technical management and design to wild things and places threatens to override these autonomous processes, thus converting wild nature into a technological artifact.

What is therefore needed, I proposed, is an ethic, which, like the variants of knowing and design I discussed, begins with wild nature and is not simply an extension of modern thought expanded and applied to wild nature. Wild ethics, unlike modern theoretical ethics, starts with sensual experience of the wild—exemplified by places at the fringes of human control and deliberate manipulation—and an

[85] Rachel Carson could probably be counted here as well, as could Gary Snyder and David Abram, though these latter two are not scientists.

attentiveness to the wild aspects of human interiority and embodiment. This creates conditions whereby what is right may appear by allowing "the situation to live itself into the imagination through the medium of the senses." This gives things their due, opening space for the poetic foundations of right action to emerge, and the forging of a proper relationship when this is appropriate.

Characteristics of Wild Ethics

"Education, I fear, is learning to see one thing by going blind to another." —Aldo Leopold (1949)

In this section, I detail five characteristics of wild ethics: Wild ethics operates "in the wild"; it is forged in the wild; it is not simply and narrowly determinate as theory; it takes on an alternate form; and it is open to multiple streams of ethical traditions.

1) "In the Wild"

The phrase "in the wild" is often used by scientists and engineers to mean beyond the laboratory—found for instance in the title of these academic articles: *Towards Facial De-Expression and Expression Recognition in the Wild* (Hu, et. al., 2019), *Cognition in the Wild* (Hutchins, 1995), and *Diabetes Self-care in-the-Wild* (Storni, 2014) [86]. Wild ethics is applicable "in the wild"—meaning real, everyday, uncontrolled, messy, in vast interconnected networks—the realm where theories and plans inevitably fall short and break down—where unbridled complexity reigns. Not the realm of hypothetical trollies, in other words. Wild ethics thus dovetails with real ethics; it is realist in the sense of removed from the ivory tower into the material everyday of actual lives and situations—in the open meadows

[86] See also: "'People sometimes ask me why I bother with these bizarre hypothetical dilemmas [trolley ethical thought experiments],' Greene wrote in 2009, by which time he'd joined the psychology faculty at Harvard. 'To me, these dilemmas are like a geneticist's fruit flies. They're manageable enough to play around with in the lab but complex enough to capture something interesting about the wider and wilder world outside'" (Engber, 2018).

outside of the corrals. If practical environmental ethics starts from environmental issues, wild ethics, like real ethics, starts from concrete particulars.

Wild ethics is thus open to empirical considerations of everyday decision making, which occurs "in the wild"—how do people actually come to understand what is right and make decisions based on this understanding[87]? And how does this vary across cultures? Particularly people and cultures engaged with wild things and places. A space is therefore opened for dialog with disciplines such as the anthropology of ethics and field philosophy in reconsidering the second component in a contrast between…

> everyday reflective thought, practical judgement, and experience on the one hand and our most influential theories and publicly validated normative standards on the other; a contrast, that is, between the variety and complexity of how we commonly think, and the narrowness and rigidity of how we often think we ought to think (Laidlaw, 2014, 214).

Another realm of the wild in this sense is that of Level III technological systems, including the contingencies of rapid change, described in the *Techno-Human Condition* and treated in the first chapter of this dissertation. A Level III system is an earth system or a system of systems, which is effectively ungraspable, non-bounded, and wickedly complex. The authors propose a metaethical comportment that "shares the characteristics of unpredictability, uncertainty, and complexity" with these Level III systems (Allenby & Sarewitz, 2011, 184). They posit that ethics, like culture and technology, is subject to evolutionary change: "The assumption that ethical frameworks are stable is valid only in the short run" and "the cultural models and assumptions on which ethical systems are built will themselves evolve and change" (Allenby & Sarewitz, 2011, 185).

What is therefore required is "a process orientation to ethics, where the imperative is one of engagement itself." By engagement here, they seem to have in mind primarily institutional engagement

[87] It might be better to describe what I am after here as experiential observation rather than empirical; ethnography for instance involving long-term immersion with a group of people may be better described as such. Experimental philosophy and its cousin approaches in psychology do not typically occur "in the wild."

with Level III systems—an "ongoing dialog with systems that are changing unpredictably and in many dimensions (technological, social, natural, ethical, and economic, among others)" (Allenby & Sarewitz, 2011, 184). Individual engagement, as much as practically possible, with these systems—primarily natural systems in the case of wild ethics, is, in my opinion, also needed.

Finally, they propose that, in distinction to Enlightenment aspirations towards certainty and optimization, that "muddling" should be recognized as "an important ethical process"—that "ethics itself is an evolving system in a rapidly changing world" (Allenby & Sarewitz, 2011, 183). Muddling is also a pragmatic approach towards decision making and policy. There may rarely be complete or sufficient information to make a decision. There is however better and worse muddling; "structured and intelligent muddling" may be the best we can do. There is no formula.

2) In the Wild

"One impulse from a vernal wood
May teach you more of man,
Of moral evil and of good,
Than all the sages can."
—William Wordsworth (1798)

Wild ethics is necessarily a product of prolonged contact with the wild, from whence it is forged. This is essentially the first of Mooney's characterizations of Thoreau's wild ethics: Thoreau lived and wrote in untamed landscapes. Thoreau was deeply engaged with the wild, though sometimes in environments more domestic than might usually be considered wilderness. For instance, he visited Maine, floated rivers, and sauntered endlessly around Concord. In many ways, however, this anticipates the criticisms of William Cronon, as Thoreau extols wildness, including that found in a mixed pastoral setting as around Concord.

Wild ethics resonates as an ethical parallel to Husserl's epistemological call to return to the things themselves. Rather than starting with theory or proposition, wild ethics starts with the

environment—with sensual experience of the world. Thoreau grounds his philosophy in the "literal" (nonliteral) ground—or the waters of rivers and ponds—in contrast to the Kantian transcendental or God or tradition. In Walden, he says as much[88]. Wild ethics is therefore kin to what Edward Mooney calls experiential ethics:

> An experiential ethics rests on perceptions, on hearing, seeing, or being disgusted. A demand or invitation is encountered in *striking, immediate events*—it is certainly *not* derived from propositions proposed as a theory any rational mind should accept (Mooney, 2015, 228).

It arises as a "felt necessity" in response to a drowning child or a poisoned river—to the face of fellow human beings or of deep waters. All things may speak and make ethical demands, but not all equally and at all times (Mooney, 2015, 232).

As discussed in Chapter 4, the scientific practices of Goethe, Humboldt, and Thoreau all include a deliberate attentiveness, which has implications for ethics. Mooney observes that…

> What we'd call today [Thoreau's] environmental ethics shows up in his attention to Earth, its waters, its mountains, its varied inhabitants and vegetative covers. It also appears in his devotion to natural history, which brings him in touch with creation through time. He embodies the scientist's virtues of disciplined observation and inference and the philosopher's penchant for large-scale vision and imaginative elaborations. Thoreau did not see his observational, scientific activity as irreligious or morally neutral (Mooney, 2011, 113).

Of course, Thoreau, in looking past tradition, is himself following in a sort of tradition. The poet Wordsworth, one generation ahead of Thoreau, in the sixth stanza of *The Tables Turned* included above, rejects the sages in favor of the experience of wild nature in grounding moral understanding. Wordworth's position is extreme (though to be fair he does employ the qualifier "may"), but I think it

[88] Let us settle ourselves, and work and wedge our feet downward through the mud and slush of opinion, and prejudice, and tradition, and delusion and appearance, that alluvion which covers the globe, through Paris and London, New York and Boston and Concord, through church and state, through poetry and philosophy, till we come to a hard bottom and rocks in place, which we can call reality, and say, This is, and not mistake... (1854, 95-6).

captures something fundamentally correct. To meet the ethical demands of the world, one must first properly see, must know where and how to look, and be open to what might be found.

Misery and Grandeur

> "I found an earlier *persona*—my mask as a critic-only, a detached refutation machine—quietly depart." —Edward Mooney (2015)

Albert Borgmann draws our attention to the need to recognize both the world's misery and its grandeur—to include the beauty of nature and art. Often, however, academic writing is fixated on the former: injustice and human suffering, hypocrisy and hidden ideology, degradation and violence. These of course deserve attention. But there is a shadow side to this kind of one-sided analysis: most notably the neglect of grandeur and the implications this has. Anthropologist James Laidlaw in assessing his own discipline observes that "the anthropology of suffering" has replaced exoticism:

> In social analysis carried out in this vein, it passes for hard-headed insight to portray any state of affairs in any part of the world as always the same self-interested contest of power and resistance: an ethnocentric projection of the Modern West's most self-hating self image (2014, 7).

Cultural relativism, if it ever really existed, has largely given way to political economy and power reductionism.

Edward Mooney likewise observes that before encountering Thoreau he was a "critic-only, a detached refutation machine" (Mooney, 2015, 27). And as I discussed in previous chapters, science and scientific practices are also implicated in this neglect, not through a lopsided emphasis on misery and suffering, but through a stance of dispassionate detachment and a thoroughly technical rendering of the world. The world itself in its wonder cannot shine through.

Perhaps the clearest, though by no means only, manifestation of grandeur is the sublime. While critical minded power reductionists might "link the sublime to mesmerizing and subduing political

devices,"[89] the sublime is more generously understood as a revelation "of the world as a place overflowing with meaning—even holy" (Mooney, 2009, 9)—a "limit experience," wherein meaning is found in an encounter with unbridled, inhuman nature (Deliège, 2016, 417). This is a central value of grandeur: offering a sense of ourselves as meaningfully situated in the world, even after, like Thoreau on Ktaadn, our meanings seem to break down in the face of nature's indifferent and imponderable vastness.

Grandeur reveals the limits of calculative reason and the limits of critique. Natural grandeur is however most accessible in the meadows and forests beyond the corrals of academia—beyond the constructed halls where thin academic constructs are constructed and in turn deconstructed apart from this originary experience.

3) Not Simply and Narrowly Determinate as Theory

"Nothing so important as an ethic is ever 'written'…It evolve[s] in the minds of a thinking community."
—Aldo Leopold (1949)

"Theory is no refuge from the wilds of our worlds and experiences."
—Edward Mooney (2011)

I noted in Chapter 4 that the original Greek sense of theory (theoria) meant a traveling to behold, or as Heidegger has it: "to look attentively on the outward appearance wherein what presences becomes visible and, through such sight-seeing-to linger with it" (1977c, 163). Philosopher Henry Bugbee likewise provocatively defined philosophy as "a walking meditation of the place" (1999, 7). As opposed to the modern meaning of theory, to include modern science and ethics, as "a formal, abstract

[89] See footnote 67 + "In more recent decades...beauty has become suspect...Beauty has in some quarters become bound up in ideology...there is no denying that the veneration of the beauty of nature, which Wordsworth made the fount of his philosophy, has largely ceased to figure in high culture since modernism contemptuously swept it aside..." (McCarthy, 2015, 156-158).

intellectual grasp of the widest expanse of things" that operates with "intense focus and propositional certainty achieved through argumentative rigor" (Mooney, 2015, xiv).

There is however an alternative philosophical heritage that embraces the embodied, the poetic, the literary, and the self-transformational, relying instead on "non-argumentative but nonetheless philosophic thought"—"an alternative canon where reason is not at odds with a religious and poetic sensibility" (Mooney, 2015, 204). Epitomized by Thoreau and a number of continental philosophers, this is a "non-professionalized way of ethics" that literary scholar Stanley Bates has called "great moral philosophy," whose practitioners produce narrative or "reflect on the narrative structure of human existence, not in order to provide a formula, or a template, of human existence, but to deny the possibility of such a formula" (Mooney, 2015, 105).

Wild ethics, based on David Abram's description above, is more an ethos—a basic disposition or outlook—than an ethics in any formal sense. In distinction to the narrow and precise (and therefore necessarily incomplete) aspirations of modern ethics, wild ethics is inherently eclectic (as it should be given that it operates "in the wild"). Though virtue ethics has developed into a modern theoretical system in its own right, Alasdair McIntyre's and Bernard Williams's criticisms provide a promising starting point, along with the derivative ethical approaches of care and narrative ethics. These are more conducive to an experiential ethics, which responds to the world's immediate solicitations. Other brethren approaches are place-based ethics, older emphases on wisdom and natural law, an acknowledgement of the sacred and of daily practices in ethical life, and an inquisitiveness into conservation ethics as they have developed within the material lifeways of various cultural traditions over long spans of time[90].

[90] An oft cited example that brings together place-based and conservation ethics is Basso's *Wisdom Sits in Places*. Place has been an important component of anthropological work since its publication, which documents the Western Apache's moral relationship with geography that "makes the people live right" via "spatially anchored" experience, names, and stories (1996). In other contexts, this has been called a moral topography (Ballard, 1998), or a moral cosmology—a meaningful and reverent relationship to a place, deeply engaged with interconnected

This eclecticism is manifested in Edward Mooney's third characterization of Thoreau's wild ethics: as opposed to "school-taught" ethics, Thoreau instead gives a plurality of angles and moods—not only of the fullness of actual ethical life, in its emotional and intellectual complexity, but of the places in which it takes place. Wild ethics derives from the experience of living and interacting with the world. It is in this sense poetic. Modern theoretical ethics on the other hand epitomizes the technical. An alternative characterization, to borrow from Nietzsche's schema, may be that in striving for laws, rules, and calculations for right action, modern ethics is Apollonian; whereas wild ethics is Dionysian in responding to "immediately impacting calls, solicitations, or demands" (Mooney, 2009, 67)—the sheer wild presence of things—the "vital and dark ground" of objectivity (Abram, 1997, 30).

This experiential element of wild ethics is contrary to the modern severance of fact and value as well as the elimination of final in favor of efficient cause—at least the ethical implications this has, namely "the loss of nature as a normative principle" or an accompanying loss of the "sense that there is a natural order to the world, a way (Dharma, Tao, telos) in which things are meant to develop" (Frodeman, 2003, 119). This absence "has encouraged a proceduralist approach to ethics" (Frodeman, 2003, 44). Rather, "the real is confronted as value laden," and wild ethics thus responds to the "moral of necessity"—an "experiential ground of felt compassion," which is situated somewhere between Hume's ungrounded sympathy and a Kantian faith in "reason's law-like necessity" (Mooney, 2009, 26). This is more akin to an older natural law tradition.

It also responds—contrary to the "apathetic fallacy"—to the "radiance of particulars and their capacity to speak"—"the measure of the silent presence of things":

> "flurries of snow were flying. The aspens and larches took on a yellow so vivid, so pure, so trembling in the air, as to fairly cry out that they were as they were, limitlessly. And it was there in attending to this wilderness, with unremitting alertness and attentiveness, yes, even as I slept, that I knew myself to have been instructed for life" (Bugbee, 1999, 96).

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materiality, as opposed to a detached, universal stance common in science, technology, and economics (Borgmann, 2006).

This immediate presence works on our intuitions and is only later effortfully constrained and disciplined by moral reasoning and codification. Wild ethics thus works at the level of immediacy. It is in this sense personal, embodied, and lived. Rather than an abstract system that one merely understands—or some form of procedural or methodical reasoning—wild ethics is self-transformative. It is this distinction that I think Thoreau was after when he wrote that "There are nowadays professors of philosophy, but not philosophers. Yet it is admirable to profess because it was once admirable to live" (1854, 14). Clearly there is value to professionalization, but Thoreau draws our attention to something that is lost. A professional in the modern sense of a technical expert in a field may lack the personal sense of character, judgement, or conviction that may have once necessarily accompanied the pursuit of wisdom.

Aldo Leopold warned of the "spiritual dangers" of not owning a farm (1949, 6). What I think he had in mind in saying this were the loss of engagements and practices that afford the kind of personal connection and self-transformation that these enable. Albert Borgmann likens the relationship of ethical theory and practice to that of the skeleton and flesh: "Theories are hard and austere; practices are soft and rich. Theories are clear and precise; practices blend with one another and are ambiguous" (2007, 90). Practices are interwoven in our daily lives. They have moral significance and are constrained or enabled by the design of our material surroundings. Practices are for Borgmann integral to maintaining our sense of reality and to cultivating excellence.

In Chapter 4, I drew attention to the scientific practices of Goethe, Humboldt, and Thoreau, pointing out that the nature of scientific practices has moral implications. They each sought to overcome the controlling detachment of an emerging modern science by incorporating various forms of active beholding as an important corrective to scientific and technological mediation. Wild ethics thus goes beyond theory to incorporate practices, both everyday and scientific.

In responding to immediate particulars, wild ethics is both emplaced and responsive to the world's grandeur:

> Our response to nature includes the recognition that nature makes claims upon us. Our attraction to nature is in many cases grounded in a sense of awe and reverence before the tremendous forces and mysterious processes that have formed our world (Frodeman, 2003, 4).

I think it is fair to generalize that the wilderness conservation movement has been deeply guided by a sense of the sacred, beyond the language of rights and obligations, rooted in experiences of nature's grandeur—particularly as tied to specific places. This resonates with religion and nature scholar Bron Taylor's reflection that "it may be that there is a twin root for both ethics and religion, in the affective human experience of the value of life" (Taylor, 2017 12). A sense of the sacred is rooted in an intuitive affective response to things and places, providing us orientation and gratitude such that "reality engages us rightfully as the sacred" (Borgmann, 2007, 194). This sense need not rely on the siphoning of institutional structures or conceptual domestication.

There are limitations to experience of course. Places and times distant from us are further from direct experience. Level III technological systems (or hyperobjects) may be outside of our experience and cognitive grasp, but the basic grounding of ethics can still be found in experience. And one thing that experience reveals is the ungraspable mystery of things. Things, places, and people, if given proper attention, will stand out in their complexity and ultimate unknowability, and this is in fact part of their "immediate solicitation."

Finally, as a variant of experiential ethics and thus a substantive outcome of immersion in the lifeworld, wild ethics is akin to what might appropriately be called wisdom. In this sense it parallels the experiential knowing of Goethian science. Rather than an a priori rationally determined formula for right action, wisdom emerges from the interplay of practical interaction and reflection. This emphasis on wisdom appreciates that ethical development, like learning in general, proceeds from conscious rule-

following towards an increasingly intuitive and holistic stance. Philosopher Martha Nussbaum—in taking up Aristotle's phronesis or practical wisdom—compares ethical decision making to ship navigation: "The experienced navigator will sense when to follow the rule book and when to leave it aside...There is...no formula." Excellence (whether moral or nonmoral) consists instead of "responsiveness and yielding flexibility, a rightness of tone and a sureness of touch that no general account [can] adequately capture" (Nussbaum, 1992, 72). Lastly, wisdom necessitates a core of humility. This is epitomized by what is usually referred to as Socratic Ignorance—Socrates' admonition that whatever wisdom he has is only in recognizing the limits of his knowledge.

Concerning ethics, this entails—contrary to the general disposition of professional ethicists—a lack of certainty about what if any ethical theory may be correct, much less applicable in a given situation. Thoreau's Sympathy with Intelligence encapsulates this position of unknowing, which "technical research won't dislodge" (Mooney, 2015, 70). Thoreau implores us to remember this: "The highest we can attain to…is the lighting up of the mist by the sun. Man cannot KNOW in any higher sense than this" (1862). Alexander von Humboldt was likewise described to possess a "calm yet persistent refusal to submit to definitions" and a natural inclination that "always tended toward the undefined, the unfinished, and the open" (Meinhardt, 2019, 248).

4) Takes on an Alternate Form

"One cannot simply extract the analytic content from the story; the story has to be told, experienced, undergone, in order for its force to be felt." —Colin Jager (2014)

Wild ethics is the poetical counterpart to technical ethics. Things, places, and situations are themselves conjured through evocative language—the products of embodied experience. As such, it "lies toward the margin of a philosophy modeled on science or the law"—analytic philosophy and modern theoretical ethics in other words (Mooney, 2009, 49). Technical philosophy assumes an

"impersonal, technical style, stripped of voice—the personal voice subordinate to and perhaps buried by the dictates of impersonal reason, or by the obligation to review arguments and words other than our own, without the least eye to making them our own" (Mooney, 2009, 101).

I offer here two exemplary examples of environmental ethics as technics—each more akin to symbolic logic than poetry:

> Even after we have found (X), we may continue to use the PAP in most cases. But it will be only a convenient form of short-hand. In some cases (X) and the PAP will diverge. And we will here appeal to (X) rather than the PAP. —Derek Parfit (2010, 120)
>
> OR
>
> Given that 'uncertainty' is understood to include cases wherein knowledge of the probabilities of relevant outcomes is importantly incomplete, MPP is far from trivial and often recommends against cost–benefit analysis approaches advocated by many critics of PP. Consequently, the first horn of the dilemma is mistaken: MPP is a substantive and informative proposition. However, MPP only places restrictions on what sorts of rules should guide environmental policy-making and does not directly guide environmental policy decisions, which leads to PP proper and the second horn of the dilemma. I argue that the second horn of the dilemma is unsound because it overlooks a central and longstanding component of applications of PP, namely proportionality. —Daniel Steel (2013, 322)

Though this sort of prose might be characterized as "impersonal, weightless language" (Mooney, 2009, 51) and understood as an example of what Heidegger described as "a merely functional interplanetary instrument of information," there is of course a proper place for it in environmental ethics and elsewhere. Just as with science and design, however, poetics—in this case, the concrete and experiential rendered in prose, providing testimonial to the particularities at stake as well as an overall sense of orientation and significance—should guide and direct technics within environmental ethics lest it remain impotent in the face of technology.

I opened this dissertation by critiquing modern ethics as essentially technological, insofar as it accepts the criteria of knowledge and explanation set out by modern science, and thus shares this "basic form of technological thinking"—a form of thinking, which is in turn reflected in writing. By emphasizing poetics, I am reiterating Edward Mooney's position that delivery matters morally:

> When we talk in moral or aesthetic or spiritual domains, it only harms intelligibility if we speak dryly without passion or involvement. We must evoke the domain of our concern…Lyric brings the presence of what matters alive—vividly, musically (2009, 33).

Or again: "the form of the writing (i.e., the poetry of it) is indispensable to its philosophical meaning" (Mooney, 2011, 114). Lyric philosophy moves beyond compartmentalization and gives a holistic sense of things. Evocative writing may also move beyond merely working upon the reader's comprehension, instead shaping engagements, and beckoning the reader "to live through the text" (Mooney, 2011, 114).

Wild ethics thus finds common cause with narrative ethics' emphasis on the embeddedness of moral life in a narrative context. As against juridical or principle ethics, narrative ethics insists on the "inherent moral structure" of narrative (Frodeman, 2003, 93), which is able, even in a fictional format, to relay the concrete complexities of moral decision making, and to work on the imagination and empathetic understanding of the reader.

Narrative structure and storytelling may simply be a deeply integral component of being human—man may well be the storytelling animal—and thus crucial to our ethical understanding and therefore necessary for proper decision making. We understand ourselves as proceeding in time and embedded in contexts of contingency (Meretoja, 2013).

I have repeatedly returned to the role of narrative in this dissertation. I appealed to Oliver Sacks's use of clinical tales to offer a depth to individual ailment and care in contrast to typical clinical portrayals of sickness flattened by instrumentation. I also invoked the Wilderness Character Narrative as a management document, which does more than "complement and enhance" scientific monitoring: it may—ideally—serve as the poetic foundation of technical monitoring and management decision making by substantively evoking the place in question. A similar point has been made in the context of scientific research: "scientific explanation and narrative understanding in fact complement one another—science

providing facts that parameterize an issue, narrative providing the overall goal and moral purpose of research" (Frodeman, 2013, 77).

I also pointed out that narrative draws attention to the world's singularity: moments, places, and encounters with people are particular and contingent rather than mere instantiations of law or universals, in stark contrast to that which can be assured about things—the mathematical. Recognizing this, particulars take on a renewed importance and meaningfulness, evident in how things are actually experienced. Narrative conveys singularity, contingency, relations of care, and the fullness of experience.

I have sought here to say something similar about philosophical ethics—that narrative, as a representative of the poetic, can serve as a complement to the technical, but more importantly can ground and direct it, in this case as a poetic foundation of technical ethics.

5) Open to multiple streams of ethical traditions

"Ethics rules our environmental conversations, muting other perspectives."
—Robert Frodeman (2003)

"Conservation ethics does not arrive ready-made, it evolves."
—Fikret Berkes (2018)

The Enlightenment rejection of scholastic tradition in favor of critical reflection grounded in reason or empirical inquiry is in certain ways commendable. Traditions should not be accepted blindly, but neither is it possible (nor necessarily desirable) to escape from them altogether and begin purely from first principles. This is particularly true of traditions that have developed in the context of human relationships with land in specific locales—what has been called traditional conservation ethics (Berkes, 2018). In distinction to the formal ethics of professional philosophy—modern theoretical ethics particularly—traditional conservation ethics is informal and lived—it emerges from practical interactions with the world within a living community.

Traditions should be respected in their origins, but there is room for fruitful comparison and cross-cultural learning. This sort of endeavor can involve philosophical analysis, but assessing conservation ethics should not take place simply according to the criteria of rational internal consistency as does analytic philosophy. One possible approach utilized by human ecologists is to examine a belief or practice in terms of its functional or adaptive significance, for example in effectively managing local resources.

For instance, in a classic ethnography of a New Guinea tribal society, *Pigs for the Ancestors*, anthropologist Ray Rappaport postulates that ritual may have a cybernetic function that maintains homeostasis with local ecologies (Rappaport, 1984). Anthropologist Jerry Jacka following Berkes likewise proposes that traditional ecological knowledge may provide functional restraint or "put the brakes on" what is referred to in resilience literature as the release phase of the adaptive cycle by distributing change more evenly over time (Jacka, 2015). Functionality is just one example, which like many academic approaches is contested[91+92].

Examining environmental ethics cross-culturally may also reveal points of divergence and intersection that can challenge our own assumptions. One common example of a stark departure from what is often glossed as western environmental ethics is found in a common ethical precept amongst native North American hunters—the Cree, for instance—that "a continued, proper use is necessary for maintaining production of animals," with the additional caveat that it is animals rather than people who control the success of the hunt by knowingly offering themselves. They will however withhold this gift if they are offended (Berkes, 2018, 110).

[91] This sort of analysis also veers closely towards functional reductionism.

[92] David Abram makes a similar observation that can be thought of as a challenge to the adaptive significance of modern science: "a civilization that relentlessly destroys the living land it inhabits is not well acquainted with truth, regardless of how many supposed facts in has amassed regarding the calculable properties of the world" (Abram, 1997, 264).

This variant of conservation ethics reflects a social ontology of common personhood, kinship, and reciprocity with the non-human world that is often contrasted with a wilderness ethic (not to be confused with a wild ethic though these have substantial overlap), which, as the story goes, is based on a sense of separation of humans from nature—a criticism reflected for instance in Julie Cruikshank's contention that John Muir's "own firm categories…made no space for reciprocity between humans and nature" or William Cronon's remark that "wilderness embodies a dualistic vision in which the human is entirely outside the natural" (1996, 80) or J. Baird Callicott's reflection that wilderness "perpetuates the pre-Darwinian Western metaphysical dichotomy between 'man' and nature, albeit with an opposite spin" (Callicott & Nelson, 1998, 348). This in presumed contrast with a sense of the relationship of humanity and nature shared by many indigenous peoples, captured in this reflection from anthropologist Tim Ingold on the Koyukon in interior Alaska[93]:

> For the Koyukon, as for other hunting and gathering peoples, there are not two separate worlds of humanity and nature. There is one world, and human beings form a rather small and insignificant part of it (2000, 68).

It is evident here that an openness to varying ethical traditions can lead to a fruitful cross-cultural analysis that may challenge our assumptions, ideally spurring an introspection that may lead to a change in our own beliefs. In this case, however, many of these purported contradictions dissolve upon closer analysis. Compare the reflections above to some of what wilderness (or proto-wilderness in the case of Thoreau) advocates themselves have said:

[93] And since it is important of course to take seriously how indigenous people themselves reflect on the idea of wilderness and its accompanying wilderness ethic, and though there are no doubt an infinite variety of reflections on the topic, I include here one last example from a member of the Dena'ina in Alaska: "To some people, the word 'wilderness' conjures thoughts that we are separate from nature…but when all thoughts of the individual components dissolve…all we see is the beauty of the natural surroundings…we realize that we are not separate from nature but part of it. The wilderness…is us and it is home" (A Dena'ina Perspective, 2017).

- From Henry David Thoreau: “I wish…to regard man as an inhabitant, or a part and parcel of Nature” (1862)
- From John Muir: “Why should man value himself as more than a small part of the one great unit of creation?” (1918)
- Bob Marshall, a cofounder of the Wilderness Society, wrote that the value of wilderness is “*being part* of an immensity so great that the human being that looks upon it vanishes into utter insignificance” (Zahniser, 1957, emphasis added).
- Howard Zahniser, author of the U.S. Wilderness Act, claimed that “We deeply need the *humility* to know ourselves as the *dependent members of a great community of life*” (1957, emphasis added).
- Olaus Murie, early director of the Wilderness Society, spoke of “a realization of a *kinship* with all life on this planet” (1961, emphasis added).
- Roger Kaye, longtime Arctic National Wildlife Refuge wilderness specialist, described the essence of wilderness as “a most genuine relationship of *humility and restraint*” (2018, 13, emphasis added).
- And from Aldo Leopold, another co-founder of the Wilderness Society: “When we see land as a community *to which we belong*, we may begin to use it with love and respect” (1949, XXII, emphasis added)

Perhaps therefore our assumptions will be challenged in ways we do not expect.

In William Cronon’s well-known constructionist critique of wilderness, he wrote that we were taught to see God on the mountaintop by a complex cultural construct inherited from Judeo-Christianity by way of Romanticism. It is however far from obvious that this is a culturally limited and historically specific idea, because in fact similar beliefs are broadly shared across the world by many people who live with mountains: “Around the world and across cultures, mountains and glaciers have powerful symbolic

significance," which includes widespread belief in the "sanctity of high places," or a sense of mountains as "natural temple[s]" (Allison, 2015, 4).

Indigenous mountain peoples, especially in the Himalayas and Andes, speak and act in ways that closely resemble the language and ethics often used to describe and manage Wilderness in the U.S.. For instance: "In the Himalayas, deities are believed to reside on mountaintops to distance themselves from the squalor and pollution of human life" and "who resent human disturbance," like trash, helicopters, and the "vanquishing attitude" of some climbers (Allison, 2015, 6). It is due to the local people's "attitude of reverence [which] suggests that humility, respect, and awe are experienced in relation to that which is revered" and subsequent "virtues of *restraint and humility*," that some have enacted protocols such as restricting science access to mountains to protect "the sacred glacier from human intrusion" (Allison, 2015, 7, emphasis added).

Attitudes of humility and restraint that form in relation to features of natural landscapes is a common defining feature of wilderness and an important component of many indigenous people's sense of place. This is not limited to mountains either; sacred groves are a widespread phenomenon throughout southeast Asia, and parts of Africa (Barrow, 2010)—forms of protection known to benefit nonhuman species.

Though "sacred" may be a shared term, my intent is not to argue for equivalence in ontological conceptions of nonhuman nature or forms of protection between western and non-western, or between indigenous and non-indigenous, people. For instance, a literal belief in mountain deities is outlandish to most residents of contemporary developed nations, even those most devoted to mountains. But if this is interpreted as a way that "local people can extend an ethics of care to their biophysical surroundings, through the mediation of personified deities" as opposed to a "techno-industrial understanding" (Allison, 2015, 10); or perhaps more profoundly, as a way of naming a kind of meaningful experience that mountains provide, and the subsequent relations that result, perhaps this is more palatable.

There are of course concerns with efficacy and justice that can be integrated into such comparisons. It may be that the North American idea of wilderness is not effectively exportable to many places. It may also be that the preservationist vision of John Muir has at times led to unjust outcomes for many indigenous peoples. It may also be that certain aspects of a preservationist ethic and of some variant of a traditional conservation ethic may be in conflict; for instance, regarding whether wild animals are somehow dependent on human hunting for temporal persistence.

What each of these shares however—both a wilderness conservation ethic and traditional conservation ethics in its myriad forms—is that they all emerged from the land rather than the classroom. Each are in this sense wild ethics. Each are also adaptive responses to limited resources.

Fikret Berkes in *Sacred Ecology* defines a conservation ethic as an "awareness of one's ability to deplete or otherwise damage natural resources, coupled with a commitment to reduce or eliminate the problem." Ethics does not, in this analysis, arise spontaneously, but emerges in the crucible of resource utilization, and only under certain conditions: the development of a conservation ethic requires a resource that is important, predictable, and depletable and must be under the control of given group (Johannes, 1994, 85). Caribou for instance in its unpredictability is less conducive to the development of a conservation ethic.

"Even more significant," Berkes insists is that "ethics itself develops—through making mistakes and learning from mistakes" (2018, 148). The Maori for instance drove several land birds to extinction "but the contemporary Maori (and many other Pacific Island peoples) have well-developed systems of ecological knowledge, practice, and indigenous environmental ethics" (Berkes, 2018, 256). Native Americans may also have "contributed to the extinction of the American megafauna, but their

descendants have some of the most sophisticated systems of ecological ethics" (Berkes, 2018, 256). Crises trigger learning[94].

The vision of wilderness likewise developed in response to a dwindling resource—in this case caused by the massive postwar boom of development and extraction and the increasing ubiquity of roads and automobiles. This was a new adaptation accounting for a more populated, technologically powerful humanity by those who were witnessing these rapid changes firsthand[95].

Environmental ethics as an evolving process built on real-world learning from making mistakes is most famously evident in Leopold's *A Sand County Almanac*. Leopold "thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise" (1949, 122) but came to reevaluate this belief based on witnessing the ecological implications this had, shifting perspective (from his own to the mountain's), and most notably through a profound lifechanging encounter.

Though there may be at least some fundamental inconsistencies between preservationist ethics and many strands of indigenous conservation ethics, each arose from "long-term incremental learning of individuals from lived experience" (Spoon, 2012, 3), though in very different historical contexts. Each is also continuing to evolve. Through this process, these disparate streams may even come to meet at certain points. Some indication of this prospect is found in this reflection by Indigenous Studies scholar Enrique Salmon: "Although the word wild does not exist in the Rarámuri or other American Indian vocabularies, I can appreciate the concept of wild and wildness in its current context[96]" (Van Horn & Hausdoerffer, 26).

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[94] One environmental ethicist has therefore proposed that to develop a widespread climate ethic, we will first need to actually lose the planet's ice caps (LeVasseur, 2014).

[95] See Swanson (2015), *Where Roads Will Never Reach: Wilderness and Its Visionaries in the Northern Rockies*, for a compelling historical account of how Wilderness protection emerged in response to these developments from rural locals who were directly engaged with areas slated for massive development, contrary to the unsubstantiated account given my many detractors of wilderness as driven by "urban elites" or an arbitrarily constructed strategy.

[96] This may be a disputable claim but illustrates my point. See footnote 24.

Another lesson from the empirical study of traditional conservation ethics is that ethics in this sense is not a system. It is composed instead of flexible rules of thumb or protocols—"simple prescriptions based on a historical and cultural understanding of the environment"—that use "cues from the ecosystem as feedback to adjust for environmental fluctuations, based on an accumulation and refinement of knowledge" (Berkes, 2018, 293). Berkes gives an analysis resembling the ethical uncertainty principle discussed in the *Techno-Human Condition* (in which they refer to Level III systems). Berkes similarly describes "nested systems" or "complex systems, showing a number of characteristics not seen in simple systems, such as scale, uncertainty, self-organization, and nonlinear dynamics" (2018, 203), wherein "there seems to be an inverse relationship between the complexity of a system and the degree of precision that can be used meaningfully to describe it"—a Principle of Incompatibility (2018, 221). These descriptors would apply to ecological systems.

Though Berkes is here referring to the human relationship with complexity at the epistemological level, his insights can be usefully applied to ethics in the same manner as the "metaethical comportment" of Allenby and Sarewitz mentioned above. Just as complexity undermines Enlightenment aspirations of certainty and exact mathematical prediction, it also undermines the ethical aspirations of modern thought towards an algorithm of right action—seeking a minimum of formal rules that are contingent for their applicability on a simplified portrayal of reality. Holistic thinking may be an adaption to this sort of complexity. Berkes also compares the adaptive approach of indigenous peoples to fuzzy logic, which is capable of dealing with uncertainty and imprecision, is characterized by gradation between categories, and is linguistic (rather than numerical):

> Indigenous knowledge seems to build holistic pictures of the environment by considering a large number of variables qualitatively, whereas science tends to concentrate on a small number of variables quantitatively (Berkes, 2018, 220).

What I have been preparing to say is, that wild ethics is just such a holistic sense of the ethical environment, based on a qualitative assessment of the world that is not reducible to any simplified ethical system or evaluated by any thought experiment that might be employed to assess rightness. It is rather an evolving component of culture that is responsive to the world's complexity.

CONCLUSION

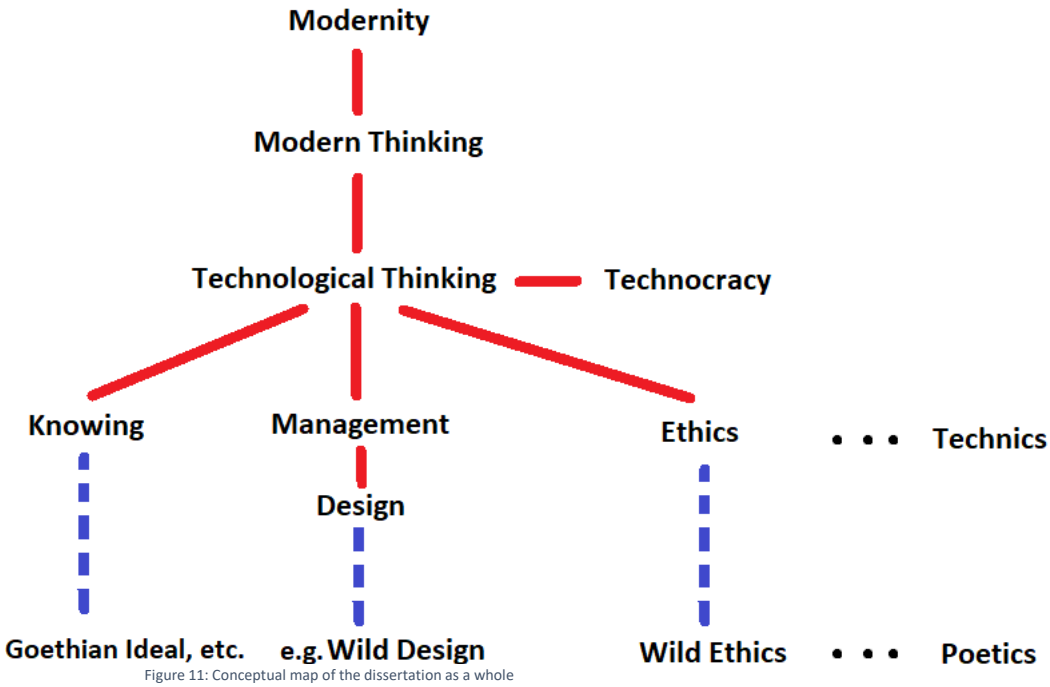

Figure 11: Conceptual map of the dissertation as a whole

In this dissertation, I have posited that modernity is distinct, and that it is defined by technological thinking in following the mode of explanation set forth by Galileo, Newton, and Descartes, and sharing in a set of characteristics to include disassembling, simplifying, and an inherently interventionist approach. While even what is typically called "postmodern" thought is often still essentially modern—even "hypermodern" when assessed through Heidegger's characterization of modernity and the broader relationship of thinking and technology.

This basic form of thinking, though initially and most clearly defined by epistemology, is evident in other forms of inquiry as well, including ethics, and is ultimately expressed in our relations with nature through management and design.

I compiled a wide variety of alternative ways of knowing (or at least attempts at formulating alternatives) that seek to move beyond modern thought. A significant commonality amongst many of these is the incorporation of poetics. I assess only a select few, particularly Goethe's attempt at

formulating a scientific methodology that ran counter to that of the emerging modern scientific approach epitomized by Newton. Goethe sought an experiential rather than an experimental science, and his approach would go on to inspire Humboldt and Thoreau, eventually trickling through time into varying approaches toward knowing and managing wild nature, culminating for the purposes of this dissertation with the Muries.

I compared this lineage of poetic science with the more thoroughly technical lineage of the Craigheads—each on competing sides of a rivalry over the appropriate forms of management and science in Yellowstone National Park and beyond.

Based partly on Heidegger's diagnosis of the danger of technology and his hope for a saving power, I offer an alternative mode of inquiry and thought, which I deem poetics. Poetics is a qualitative, nonformulaic assessment of what is true and what is right, which is fundamentally derived from embodied, sensuous experience of the world through a combination of practical everyday interaction, deliberate attentiveness, or rarer experiences in which our sense of self and world are challenged and, in some instances, shattered.

I expand this attempt to move beyond modern technological thinking to management and design in a practical context, utilizing examples taken from medicine, architecture, land management, and climate change mitigation, before concluding with a similar effort in terms of ethics, particularly environmental ethics that is concerned with the perpetuation of wild things and places into the future.

The ethical approach I offer is forged in experience and drips with the wild presence of things. It is concrete, personal, evocative, and sits at the limits of theory as it is usually understood. Wild ethics is poetic in the sense that I have defined—in short this means that it operates contrary to the dictates of technology and as such fundamentally challenges technocratic management and design of earth systems both large and small. Wild ethics is however still struggling to be born.

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Appendix A - Brief Reflections on Heidegger's Nazi Involvement

Heidegger infamously never apologized for his Nazi involvement. However, his relationship with the Nazis was somewhat ambiguous. Heidegger had a Jewish mentor, Edmund Husserl, and several Jewish students who would become prominent theorists, most notably Hannah Arendt and Herbert Marcuse, the former with whom he had had an affair. His private journals, recently published as the *Black Notebooks* include some comments that appear strikingly antisemitic[97], alongside other reflections that could be construed to belittle racism[98]. Some of Heidegger's public comments also seem to lend credence to his having a more distant relationship with the Nazi party than is sometimes portrayed: "a rift separated the National Socialist conception of university and science from my own, which could not be bridged" (Heidegger, 1985b, 497) and "anyone with ears to hear heard in these lectures a confrontation with National Socialism" (Heidegger, 1976, 274)[99][100].

There is also evidence that Heidegger was somewhat politically oblivious. He operated on a high metaphysical level, and from such a vantage infamously equated industrial agriculture with concentration camps. This equivocation may capture something of the same aspect of the Enlightenment's dark side yet is clearly problematic (Zimmerman, 1990, 250-1).

[97] "World Judaism is ungraspable everywhere and doesn't need to get involved in military action while continuing to unfurl its influence, whereas we are left to sacrifice the best blood of the best of our people." (Heidegger's "black notebooks", 2014)

[98] For instance: "That the great prophets are Jews is a fact whose secret has not been thought through. (Note for asses: this observation has nothing to do with 'antisemitism.' The latter is as silly and as reprehensible as the bloody and above all unbloody procedures of Christendom against the 'pagans.'…)" (Heidegger, 1946)

[99] "Heidegger himself struggled against the Nazis' and students' demands for the posting of the Jewish proclamation ("Only a God . . ." 269) and for book burnings ("Only a God . . . " 271), faculty power plays for promotion, and the education minister's request for the dismissal of Jewish professors, over which Heidegger subsequently resigned ("Only a God . . ." 273-74)." (Glazebrook, 2000, 158)

[100] When Heidegger explicitly addresses Hölderlin's hymns "Germanien" and "Der Rhein" in 1934-35, it may be his first expression of a dissociation from his own political commitment as well as from official National Socialism. At the very beginning of the lecture, Heidegger raises explicit objections to Rosenberg's racial ideology and to Kolbenheyer's biologism in addition to Spengler; in a rather warped view, he thinks he can attribute these positions to a "liberalist" manner of thought (Gesamtausgabe 39:26-28)…In his *Contributions to Philosophy*, Heidegger even calls the National Socialist racial ideology "pure stupidity" (Gesamtausgabe 65:63). (Grossman & Goodwin, 2004, 36)

Finally, Heidegger influenced the development of political thought on the left, including for Arendt, Marcuse, Foucault[101], Gadamer, Derrida[102], Latour, and Haraway. A historical perspective on the development of ideas reveals the continuing necessity of understanding Heidegger's contributions.

[101] "Heidegger has always been for me the essential philosopher...My whole philosophical development was determined by my reading of Heidegger" (Foucault, 1988, 250).

[102] "Jaques Derrida, perhaps the most brilliant continental philosopher since Heidegger, calls Heidegger, 'uncicumventable', noting that his own work 'would not have been possible without the opening of Heidegger's questions.' Derrida insists 'that Heidegger's text is extremely important to me, and that it constitutes a novel, irreversible advance all of whose critical resources we are far from having exploited' (Idid., 54). Even his famous term 'deconstruction' was partially inspired by Heidegger's early 'Destruktion' of the tradition" (Braver, 2009, 127).

Appendix B – Ways of Knowing-Managing

Type	Definition	Who	Example(s)	Source(s)
Modern Science	Modern science, coupled with modern technology, is the basis for how nature is known, surveilled, and managed, exemplified in the case of the Craigheads' application of Cold War technology to Yellowstone area grizzly bears and other wildlife. Heidegger identifies the essence of modern science (and thus technology) with an a priori projection of the mathematical. Echoing a sentiment found in Goethe, Aldo Leopold specifically recognizes "Conventional Physics" as problematic: "In terms of conventional physics, the grouse represents only a millionth of either the mass or the energy of an acre. Yet substract the grouse and the whole thing is dead" (1949). Environmental ethicist J. Baird Callicot characterizes modern science thusly: "'modern' science, which came into its own in the seventeenth century C.E., is just Western natural philosophy consolidated and united by a universally accepted paradigm (the mechanical paradigm), method (the inductive-hypothetical-deductive-experimental method), and division into areas of inquiry (astronomy, astrophysics, physics, physical chemistry, chemistry, biochemistry, biology, and the rest)" (Callicot, 1997, 191)	Predominant; many, especially Newton and Galileo	Craigheads' wildlife biology, U.S. Army Corps of Engineer's Project Iceworm	
Post-Modern Science	Environmental ethicist J. Baird Callicot attempted to formulate "an environmental ethic grounded in a postmodern scientific worldview." He describes postmodern science thus: "Although we may be able to apprehend the world through a variety of conceptual frames of reference, we cannot apprehend it independently of any conceptual frame of reference whatsoever. The emerging postmodern scientific worldview has its roots in a tradition of Western natural philosophy more than twenty-five hundred years old. It has, however, through its own internal dialectic, burst out of its distinctly Western conceptual cachet. To be sure, postmodern science is continuous with modern science and thus with premodern Western natural philosophy. The same central tripartite quest drives it. And more or less the same scientific method that disciplined inquiry in modern science disciplines inquiry in postmodern science. Modern and postmodern science differ in the substantive worldview or paradigm each presents, not in the questions regarded as worth pursuing or the method used to pursue them" (Callicot, 1997, 197). A similar description is provided by philosopher Michael Zimmerman: "The non-mechanist narratives of post-modern science suggest that the natural world is far too complex and diverse to be understood in terms of a single principle, despite the ongoing search for a 'grand unified theory' in physics. Post-modern science, then, not only helps to undercut the basis for totalizing narratives which promote domination, but also sets the stage for overcoming the humanity-nature dualism which has helped to justify the 'exploitation' of nature without and nature within" (Zimmerman, 1990, 273).	Callicot, Zimmerman		*Heidegger's Confrontation with Modernity* (Zimmerman, 1990). *Earth's Insights* (Callicot, 1997)
Pre-modern Science (Aristotelian)	Heidegger identifies pre-modern Aristotelian science as experiential in contrast to empirical (experimental) modern science. Heidegger characterizes Aristotelian science as operating according to a model "in which the phenomena themselves are the basis for generalization"; "Heidegger argues that the modern scientific experiment is more than the 'looking around' of Aristotle's style of observation. As a going toward something and a testing, the experience gained through experiment is already what he calls a seeking. Experience has in this account a kind of 'letting be'" (Glazebrook, 2000, 95). Heidegger also seems to suggest that pre-modern science includes a reflective, philosophical approach missing in modern science: "Aristotle's 'physics' is philosophy, whereas modern physics is a positive science that presupposes a philosophy" (Heidegger, 1991, 62-3). Philosopher Daniel Berthold finds in Aldo Leopold's poetic science (wherein J. Baird Callicot finds the seeds of a post-modern science)	Aristotle		Heidegger describes in Beitrage (1989)

	echoes of a pre-modern science, which incorporates "the desire to see in a way that goes beyond the mere surface and appearance of things to a deeper recognition of meaning. Science is born in wonder, in curiosity, in the experimentation with different perspectives, in the testing out of different ways of seeing and conceiving things" (Berthold, 2004, 207).			
Natural Philosophy	Closely related to Aristotelian pre-modern science, natural philosophy is both precursor to modern science and substantively distinguished from it in several respects. One commentator has noted that natural philosophy, in distinction to modern science, tried "to express the essential qualities of nature by ways [sic] of qualitative studies" (Christensen, et. al., 2008, 4). Heidegger identified one key difference in that natural philosophy "searched for the metaphysical essence and hidden causes arising in immediate actuality" (Glazebrook, 2000, 17). The main distinction may thus be in the differing relationship of naturalness and normativity: "The main concern of natural philosophy was not with what we call *nature* (rocks, animals, ecosystems), but with the *natural*. The natural order of things possessed prescriptive and proscriptive force: the way things were implied the way things were supposed to be"; "this two-thousand-year tradition had continued from Thales (sixth century B.C.) through the nineteenth century German idealists Hegel and Schelling. With Schelling's death in 1854, natural philosophy turned into the philosophy of science. It was a momentous shift: philosophy no longer sought the purpose of our lives within the processes of the natural world. Now the scientific method provided our only rational access to the world, with natural philosophy and theology passing into the shadows. And the scientific method revealed only a physical world driven by blind causes. To highlight what was at stake in this shift from natural philosophy to the philosophy of science, it is perhaps more useful to refer to the former as *cosmology*, for its goal was to identify humanity's proper place in the *cosmos* or universe"; the tradition of natural philosophy "died at the hands of modernism. The philosophers of modern science—Bacon, Descartes, Galileo, Newton—described a world devoid of purpose: only efficient or mechanical causes rather than final ones existed" (Frodeman, 2003, 43).			*Geo-Logic* (Frodeman , 2003)
Personal Knowledge (also Professional Judgement and Informed Intuition)	*Personal knowledge and professional judgement* acknowledge "the fundamentally interpretive nature of [scientist's] research": "Adjusting for constantly changing conditions requires a nuanced sense of one's work, what the biologist Michael Polanyi calls 'personal knowledge.' In our culture this phrase is an oxymoron: if a claim is personal, it cannot be real knowledge, and vice versa. On this account, real knowledge must be objective, untainted by personal factors. But this puts scientists in the position of not being able to acknowledge a major source of their understanding, the intuitive grasp that comes from years of working intimately with a subject. We always make more of our experiences than can ever be tallied; walking the outcrop or working in the lab, we quietly absorb a thousand small signs that lie beneath every lawlike generalization. Scientific reasoning, like reasoning in general, depends on deliberation and judgment" (Frodeman, 2003, 35). A closely related concept is "*informed intuition*". This is, in the context of design, a creative process that is neither the result of calculation, analysis, nor codification, but is rather "the result of a [free, but not arbitrary] process in which elements of memory and experience–of environmental imagination–are brought to bear on the qualities" of design (Hawkes, 2019, vi). *Informed intuition* is well captured by these reflections from paleoclimatologist Lonnie Thompson: "Yes. It's intuition, I'm sure I'll have a good feel for the quality of the record by the time we leave Kilimanjaro. You just have to get a feel for it" (Bowen, 2005, 276).	Michael Polanyi	Architecture	*Geo-Logic* (Frodeman , 2003) *Personal Knowledge : Towards a Post-Critical Philosophy* (Polanyi, 2015) *Environmental Imagination* (Hawkes, 2019)

	Goethe likewise referred to *intuitive judgement*, defined by one scholar as "a specific intuitive capacity of judgment that is at once perceptual and intellectual" (Fischer & Nassar, 2015, 11). The newer term grok is a pertinent concept for visceral knowing in this sense (Judge, 2003).			
Cowboy Biology	The basis for scientifically uninformed and commodified management of nature, based on a tourist-centered vision, exemplified by National Park Service management in Yellowstone and Yosemite prior to the 1970s. This might be considered a "shallow aesthetics." A similar approach is found in some politician's reflections: "I have a gut, and my gut tells me more sometimes than anybody else's brain can ever tell me" (Zhang, 2019).	James Inhofe	60s era Yellowstone NP	*Engineering Eden* (Smith, 2016)
Barstool Biology	A form of personal, local knowledge referenced positively by applied ecologist Fikret Berkes (in the larger context of Traditional Ecological Knowledge): "Often dismissed as 'barstool biology', the ecological knowledges of local hunters in the northern Yellowstone ecosystem are rooted in environmental experience and situated politics" [Robbins, 2006, 185).	Yellowstone area local hunters		*Sacred Ecology* (Berkes, 2018)
Shoe-leather Study	A term used in a variety of disciplines to refer to a form of study necessitating embodied engagement—particularly walking—as opposed to armchair conjecture or technological data collection. *Ecology*: "The Muries believed in studying animals by means of old-time shoe leather. They were critical of scientists who flew around in aircraft and of technology and gadgets. They frowned on the unnecessary handling of park animals. They respected the wildness and autonomy of their subjects. As Olaus put it in his report on the grizzly work, 'fauna and flora should be subjected to a minimum of disturbance'" (Murie, 1940). Ecology: "a completely different scientific field—ecology—has experienced similar epistemological issues. The dynamics of the wolf population in Yellowstone Park" (from epidemiology article below [Rebaudet, 2017, 1113]). *Epidemiology*: This usage of shoe leather study is referenced in a journal article titled *Epistemological rehabilitation of ''shoe leather'' epidemiology: the lesson of cholera in Haiti* (Rebaudet, 2017) and in *A Dictionary of Epidemiology*: "'shoe-leather' epidemiology [is] Gathering information for epidemiological studies by direct inquiry among the people, e.g., walking from door to door and asking questions of every householder (wearing out shoe leather in the process). John Snow (1813– 1858) did this when he was investigating the sources of water supply to households in the cholera epidemic in London in 1854; the method has been successfully used in many subsequent epidemic investigations. It is especially useful in investigations of sexually transmitted diseases. Much of the work of the Epidemic Intelligence Service (EIS) is based on shoe-leather epidemiology. EIS officers have a club tie displaying the sole of a shoe with a hole in it." (Porta, 2014, 261). *Ornithology*: "Bailey and S. C. Arthur wore out a great deal of shoe leather in various marshes, endeavoring to find nesting places" (Shaver, 1941, 140). *Statistics*: Referenced in *Statistical Models and Shoe Leather* by David A. Freedman (1991), and defined by another author as "a metaphor for the hard work of gathering more and better data, discovering and dealing with systematic sources of error, and building a scientific argument along many lines of evidence" (Tong, 2019, 246).	Adolph and Olaus Murie	Ecology, epidemiology, ornithology, statistics	*Engineering Eden* (Smith, 2016) *Epistemological rehabilitation of ''shoe leather'' epidemiology: the lesson of cholera in Haiti* (Rebaudet, 2017) *Statistical Models and Shoe Leather* (Freedman, 1991)
Holistic Science	The most relevant meaning of holistic science is formulated by ecologist Stephen Harding: "Holistic science concerns itself with the rigorous and integrated deployment of the full capacities of the human psyche in order to develop a deeply and truly participative relationship with nature. In	Stephen Harding, David Bohm	Holistic landscape ecology	*What is holistic landscape ecology?*

	this respect it differs from mainstream science, which believes that we can gain reliable knowledge of the world only through analytical mathematical reasoning in order to one day achieve the ideal of complete dominance and control of nature" (Harding, 2011, 1). The term has also been applied in landscape ecology (and referred to in this application as a post-modern science) in *What is Holistic Landscape Ecology? A Conceptual Introduction* (Naveh, 2000). The term has again been used in the context of other sciences, with a variety of somewhat different meanings than Harding's, including in a comparison of systems biology as holistic in contrast to reductionistic molecular biology (Fang & Casadevall, 2011), and in Geography in *A Folk Guide to Geography as a Holistic Science* (Archer, 1995) to mean all-encompassing.			(Naveh, 2000) *Reductionistic and Holistic Science* (Fang & Casadevall, 2011)
Experiential Science (also Participatory Science and Experiential Knowledge)	In academic literature, "experiential science" has been referred to in the context of Traditional Ecological Knowledge of glacier ice in Alaska (Cruikshank, 2014, 32), and in the context of organic farming in *Experiential science as a novel scientific discipline* (Baars & Wagenaar, 2002). *Participatory Science*: Referred to in the context of fisheries management (Soomai, 2015) and what is often deemed Goethean Science is referred to as participatory science in at least one exposition on the topic (Dean Robbins, 2006). *Experiential Knowledge* has been referred to widely, including in the context of environmental humanities (*Applying the Environmental Humanities* [Kueffer, et. al., 2018), conservation (*The Nature and Role of Experiential Knowledge for Environmental Conservation* [Fazey, et. al., 2006), and in sociology of technology: "a knowledge from below reflecting the experience of subordinate participants in technical networks. This is a qualitative knowledge that is not formalized in specialized technical disciplines…Experiential knowledge is responsive to a broad range of values, not simply efficiency and control" (Feenberg, 2017, 10).		Conservation, Fisheries,	*Do Glaciers Listen?* (Cruikshank, 2000) *The Nature and Role of Experiential Knowledge for Environmental Conservation* [Fazey, et. al., 2006
Qualitative Science	"Molecular biology in general and genetics in particular have been fed to the general public in the form of mechanism, determinism, and intrinsic meaninglessness. It all adds up to a remarkable falsehood, and comes to us in part owing to a disastrous misunderstanding of the long-running dispute about mechanism and vitalism in biology. The real news about molecular biological researches of the past couple of decades is that scientists are rediscovering living creatures as *organisms of meaning*…The project aims to begin characterizing the terms of a new, qualitative science. Of course, for those scientists who identify with Galileo's commitment to a strictly quantitative science, which excludes qualities from consideration by definition, the phrase "qualitative science" will sound like a simple contradiction. And yet, in reality, there can be no science that is not qualitative; mere quantity does not give us any material content. Without qualities we have no world to try to understand. And if we must deal with qualities, then it's far better to be aware of what we're doing than to smuggle those qualities into our work in an undisciplined fashion while pretending we have nothing to do with them" (Talbott, From Mechanism to a Science of Qualities).	Stephen L. Talbott	Molecular biology / genetics	*Goodwin, Brian. "CHAPTER 7 A Science of Qualities". How the Leopard Changed Its Spots, Princeton: Princeton University Press, 2020, pp. 196-237*
Poetic Science	A form of science that includes a poetic dimension wherein nature is known by embodied, sensual encounter, exemplified in the case of the Muries' naturalist science and associated vision of wilderness without deliberate human interference. Its usage spans a wide variety of disciplines. Key definitions include: **"A form of science that, in its very art-fulness, can do justice to the ambiguity, complexity, and depth that characterizes lived experience" (Freeman, 2011, 389). **"A form of poetic discourse that seeks to reimagine the nature of science" by attempting "to return science to its [Aristotelian, pre-modern] origins"—an ecstatic science (as in ek-stasis [standing	H.D. Thoreau, Aldo Leopold,	Geopoetics, Transcendental Ecology, Medicine, Psychology	*Aldo Leopold's Poetic Science* (Berthold, 2004) *Geo-Logic* (Frodeman, 2003)

	outside or above] "that points beyond itself to its other, to poetry" (Berthold, 2004, 1-4). *Geology*: Acknowledging the presence of geopoetics as a "poetic vision constrained by the sobriety of science" reveals that "the reasoning process within field sciences like geology shares as many characteristics with the humanities as with the laboratory sciences" (Frodeman, 2003, 128). *Ecology*: Relevant here are Aldo Leopold's poetic vision in *A Sand County Almanac*, and what Nathan Cricks deems Thoreau's Transcendental Ecology "that blended the language of science with the language of poetry to transform natural events, objects, and process into vital, significant, and beautiful facts that brought together earth and heaven through a proto-ecological worldview" (Crick, 2008, 7). *Psychology*: Psychology professor Tom Freeman beckons toward poetic science because academic psychology has failed "to practice fidelity to the phenomena of concern" (2011, 1). Philosopher Walter Kaufman praised Freud for the development of "a poetic science of the mind" (1980). *Medicine*: A different sense from the above definitions in the context of medicine is given in *Poetic Science Bidirectional Reflection in Science and Medicine*. Poetic science here is essentially an integration of art and poetry into STEM fields. A very different sense of poetic science is also given in *Emerson's Poetic Science*, meaning essentially "the [inappropriate] sacralization of science" (Walls, 1997, 23). Yet another is Richard Dawkins's definition: "science inspired by a poetic sense of wonder" (2000, xii). "Poetical science" may have first been coined by Ada Lovelace, often credited as the world's first computer programmer: "You will not concede me philosophical poetry. Invert the order! Will you give me poetical philosophy, poetical science?" (in Toole, 1987, 2).			*Toward Poetic Science* (Freeman, 2011)
Romantic Science	Inspired by "the spirit of late 18th-century and early-19th century German romanticism," contemporary romantic science is a deliberately unorthodox "counter-tradition to 'normal science'" (Halliwell, 2016, 255) with strong ties to phenomenology in the tradition of William James's "radical empiricism." Romantic science works against the modern tendency to strictly divide disciplines, particularly art and empirical science. Instead, self and world, aesthetic and technical understanding, are all valuable assets in knowing the natural world (Meinhardt, 2019, 225). **"Romantic science is an open tradition which can be adopted for any practice which fuses scientific with aesthetic understanding and seeks to deal with the experience of individuals. Romantic science also carries an ethical undercurrent which directs the inquirer to the sensitive issue of knowing the other" in distinction to "abstract speculation" (Halliwell, 2016, viii). *Medicine (Neurology)*: Used explicitly as a term by neurologist Oliver Sacks (though coined by Russian neuropsychologist Alexander Luria), romantic science in a medical setting "maintains the balance between the art of medicine (figuring and imagining) and the science of medicine (inquiring and examining), in which experimentation is balanced by 'poetic vision'" (Halliwell, 2016, 201). The patient is understood in a broader sense than the instrumental data produced in the "narrow sphere of clinical observation" (xiii). It rather necessitates an empathetic collaborative receptivity toward the embodied experience of the patient wherein "the best possible route to understanding illness is through close interaction with the suffering patient, who should not be conceived as a problem to solve, but as a	Alexander von Humboldt, Oliver Sacks, H.D. Thoreau, Goethe, Otto Rank	Medicine (Neurology), Geography, Natural History	*Romantic Science* (Halliwell, 2016)

	unified person who is undergoing a variety of debilitating effects: physical, mental, moral, and spiritual" (Halliwell, 2016, 201). Importantly, "unlike scientific approaches which claim to be value-neutral, this medical development of romantic science demonstrates the impossibility of separating the object of study from the method, because the former is always already construed through the conceptual presuppositions of the latter" (Halliwell, 2016, 201). *H.D. Thoreau*: Historian Donald Worster refers to Thoreau's approach as "Romantic Ecology", a phrase coined originally by Jonathan Bate in reference to William Wordsworth in the context of literary ecocriticism, rather than science per se (1994). And in another source: As a "romantic scientist", "Thoreau saw his task to be the joining of poetry, philosophy, and science into a harmonized whole" (Walls, 1995). "Romantic scientist" has also been applied to Alexander von Humboldt by writer Maren Meinhardt (2015).			
Literary Science	*Literary Science* is referred to positively in *John Muir's Literary Science*: "In his determined amateurism and refusal to limit himself to the discourse of the professionals, Muir reached a wider audience with greater effect, gaining for himself a place not only in scientific, but also in literary history" (Gifford, 2011). Literary Science is referred to disparagingly in reference to Oliver Sacks's romantic science: "because this type of inquiry [Oliver Sacks's romantic science] often runs tangential to the hard science of neurology, critics argue that he is merely a scientific popularizer, whose publications replace the serious pursuit of science with literary pseudo-science." (Halliwell, 2016, 197).	John Muir	Conservation	*John Muir's Literary Science* (Gifford, 2011)
Sympathy with Intelligence	*Sympathy with Intelligence* was coined by Thoreau in his essay *Walking*: "The highest that we can attain to is not Knowledge, but Sympathy with Intelligence" (1862, 86). In an earlier essay, he reflects that "we do not learn by inference and deduction, and the application of mathematics to philosophy, but by direct intercourse and sympathy. It is with science as with ethics, we cannot know truth by contrivance and method" (*Natural History of Massachusetts*, 1842, 24). Likewise, he reflects in his journal, "a man has not seen a thing who has not felt it" (Journal, 2/23/1860). Philosopher Edward Mooney interprets Thoreau's Sympathy with Intelligence to be a blend of empirical observation and sympathetic immersion—an attentiveness and responsiveness to the sensuous presence of the world, revealed in moments of intimate contact. Prior to assessments of how things operate, we have a sense that the world addresses us when we are open to the eloquent poetry of things. Knowledge here is "not plain knowledge but a kind of *unknowing.* It's not unlike Socratic knowledge of ignorance. It does not denigrate ordinary knowledge (in its several incarnations) but it recommends an openness to a standing Socratic ignorance that technical research won't dislodge," akin to Socrates' daemon (2015, 69-70).	Thoreau		*Walking* (1862) *Natural History of Massachusetts* (1842) *Excursions with Thoreau* (Mooney, 2015)
Traditional Ecological Knowledge (AKA Sacred Ecology, Indigenous Knowledge, Indigenous Science, Ethnoscience, Folk Science)	*Traditional Ecological Knowledge (TEK)* is a broad and encompassing term that includes both the bodies of knowledge and ways of knowing nature held by indigenous peoples, and others with similar, long-standing relationships to specific places, gained by close, prolonged interactions with local environments, and including substantive components that are handed down across generations. Associated concepts include local, indigenous, or experiential knowledge. Philosopher Ted Toadvine opens a place for TEK with phenomenology: "if western scientific accounts of nature are understood to provide one valid and useful abstraction for understanding the natural world, rather than its definitive and	Found in the great diversity of indigenous traditions throughout the world, and analyzed philosophically by thinkers like David Abram in his consideration		*Sacred Ecology* (Berkes, 2018) *Braiding Sweetgrass* (Kimmerer, 2013) *Spell of the*

	exclusive explanation, room is made for place-based and traditional ecological knowledge as legitimately organizing experience according to different epistemic frameworks" (Toadvine, 2017, 5). Furthermore, "the concept of the lifeworld allows for legitimate ways of knowing that are distinct from those of the exact sciences and that vary historically and culturally, which may include forms of traditional ecological knowledge" (Toadvine, 2017, 9). In an effort to merge ways of knowing, some scholars have used metaphors like "the Mi'kmaq principle of 'Etuaptmumk' or 'two-eyed seeing'" (Kutz & Tomaselli, 2019). Robin Kimmerer in *Braiding Sweetgrass* uses the similar metaphors of the DNA double helix, being bilingual, and polyculture (specifically the traditional interwoven agricultural practice of many Native Americans known as the Three Sisters of corn, beans, and squash) to describe the necessity of viewing nature through the lenses of both western science and indigenous knowledge (2013). Likewise, the "mauriOmeter" was devised by New Zealand's Maori as an assessment tool comparable to cost-benefit analysis with the intent to incorporate traditional indigenous values into policy and official decision making (Ruckstuhl, et. al., 2014). Each of these are reminiscent of some of the other approaches included in this chart, which attempt to fuse poetic and technical knowing, with the former emerging largely from within the west, particularly from Romanticism's reaction to the Enlightenment. Goethe referred to this a "multifold language" (Goethe, 1996, 12: 277). These fusions also approximate Wilfrid Sellars's "synoptic vision" (or binocular vision [1963]), in a metaphor remarkably similar to that employed by the Mi'kmaq[103]. Philosopher Albert Borgmann has described three "'folk' analogues and predecessors of three scientific disciplines, physics, biology, and psychology" in order to describe our inherited human "ground state": "Folk physics is the natural understanding we have of the tangible world. We know that some things are heavy and others light, that it takes more effort to move heavy things than it takes to move light things, that some things cohere and others fall apart, etc…folk biology is our natural familiarity with living as opposed to inanimate things, our ability to distinguish plants from animals, to divide plants into natural kinds and animals into species, to determine what is nutritious and what's poisonous, etc…Folk psychology lets us read the faces of persons, anticipate their reactions, influence their behavior, etc." (Borgmann, 2020, 64). Folk glaciology is mentioned in … but this is so deeply embedded within a critical-constructionist	of animism and "oral culture".		*Sensuous* (Abram, 1997)
Integral Ecology	Integral Ecology is a self-described meta-theory that provides an overarching framework in which to integrate multiple perspectives into environmental decision making. It is based on the theory that a multitude of ways of knowing are necessary to effectively understand and manage the environment. Of note is its inclusion of subjective and inter-subjective perspectives, to include first-hand experience and culture, respectively, as well as its attention to non-human interiority. Integral ecology recognizes the problematic nature of modernity in severing art, morals, and science into separate realms of I, We, and It, and seeks to reunify them: "Integral Ecology unites the art of ecology, the Beautiful (environmental aesthetics); the morals of ecology, the Good (environmental ethics); and the science of ecology, the True (environmental science) at multiple levels of complexity" (Esbjorn-Hargens & Zimmerman, 2011, 22).	Esbjorn-Hargens & Zimmerman Wilber	Conservation, Fishery Management, Sustainable Community Development	*Integral Ecology* (Esbjorn-Hargens & Zimmerman, 2011)
Post-normal Science	Stemming from Thomas Kuhn's term, post-normal science, as originally formulated, is the product of a new scientific method, neither value-free nor ethically neutral, applied to complex public	Funtowicz & Ravetz	Fisheries, Public Health, Climate Change	*Post-normal science: a*

[103] Also Nietzsche: "[T]he *more* eyes, different eyes, we can use to observe one thing, the more complete will our 'concept' of this thing, our 'objectivity', be." (Nietzsche, 1887, 86)

	problems: "In post-normal science there is still a distinction between insiders and outsiders, based (on the cognitive side) on certified expertise and (on the social side) by occupation. But since the insiders are manifestly incapable of providing effective conclusive answers to the problems they confront, the outsiders are capable of forcing their way into a dialogue…this phenomenon is not merely the result of the external political pressures on science that occur when the general public is concerned about some issue. Rather, in the conditions of post-normal science, the essential function of quality assurance can no longer be performed by a restricted elite of insiders. When problems do not have neat solutions, when the phenomena themselves are ambiguous, when all mathematical techniques are open to methodological criticism, then the debates on quality are not enhanced by the exclusion of all but the academic or official experts. For the knowledge of local conditions which not only shape the policy problems, but also determine which data are strong and relevant, cannot be the exclusive property of an elite whose training and employment inclines them to abstract, generalized conceptions. Those whose lives and livelihood depend on the solution of the problems will have a keen awareness of how general principles are realized in their 'back yards'" (Funtowicz & Ravetz, 1990, 22).			*new science for new times* (Funtowicz & Ravetz, 1990)
Wild Science	Uses of this phrase do not quite live up to its potential, but I have nevertheless included them here to fully map the relevant terrain. In *Wild Science: Reading Feminism, Medicine and the Media*, "wild science" is coined to coalesce a variety of critical, constructionist, feminist perspectives on the relatively narrow topic of medicine: "Wild science seeks to reference the culture of science, to foreground the fact that science is made up of practices that belong to culture" and to "actively and critically engage with the public meanings of science" (2); "The juxtaposition of the words 'wild' and 'science'...[is intended] to call attention to an ideology and an epistemological framework in which 'wild' and 'science' are typically oppositional terms. Since the end of the eighteenth century, Western science has been directed towards taming nature: nature has been conceptualized as something wild, unruly and changing. This opposition takes hold with the professionalization of science and medicine in the nineteenth century and extends to a set of distinctions between science and culture, rationality and the imagination, masculinity and femininity, and so on. These distinctions have been, and continue to be, upheld by institutional formations and disciplinary methodologies, separating the humanistic studies from the sciences." (Marchessault & Sawchuk, 2000, 1). While in *Mapping Whose Reality? Geographic Information Systems (GIS) and "Wild Science"*, a very different (if utterly shallow) meaning is provided—"the probing of basic assumptions underlying current policy"—though accompanied by a nearly nonexistent analysis and disappointing definition given the compelling name (Duncan, 2006).		Medicine, GIS	*Mapping whose reality? geographic information systems (GIS) and "wild science"* (Duncan, 2006) *Wild science: Reading feminism, medicine, and the media* (Marchessault & Sawchuk, 2000)

Appendix C – Dissertation Defense Presentation

Given on 10/29/21

My dissertation is titled A Measure for All Measuring: The Need for Wild Ethics in the Technological Era

My basic premise is that Enlightenment ethics—what I call modern theoretical ethics or normative ethical theory—is insufficient—or even misguided—particularly when considered in light of the challenges that technology presents to the perpetuation of wild aspects of the earth. I apply similar critiques to modern science, and to management and design, particularly when focused on wildlands and on large-scale environmental systems like the global atmosphere. I maintain contra Latour that modernity is distinct and that much of what passes for postmodernism is in fact hypermodern—"a devolved and quintessential modernity"—insofar as it fails to challenge the tendencies inherent in technological development.

Though I do not specifically address the Anthropocene concept in my dissertation, it is relevant to my considerations. What the Anthropocene importantly represents is the power and ubiquity of technology—the near inescapability of not only human impact but of management and design. Preserving the wild—that which is thought to unfurl apart from our direction and will—is in this context a paradox.

I argue that as we seek to mitigate widespread inadvertent environmental degradation, such as climate change, pervasive pollutants, and biodiversity collapse—as we must—a new threat emerges: that of turning the earth and ourselves into technological artifacts. To avoid this, we must thus tread the line between unrestrained destructive impacts and attempts at control founded upon modern science and delivered by technology—between the inadvertent and the technically advertent. In other words, we must find a way to manage the earth in a way that does justice to the wild, utilizing means that move beyond scientific and technocratic management.

Using case studies and a genealogical-historical approach, I identify a distinct pattern reflected in a variety of historic conflicts over development or management—or the application of technology more generally—in environmental contexts, specifically regarding wild places.

This pattern is found in forester Gifford Pinchot's utilitarian scientific management that ultimately led to the damning of Hetch Hetchy in Yosemite versus John Muir's aesthetics of embodied encounter with creation, particularly centered on glaciated landscapes; it is also found in the case of U.S. secretary of agriculture under Nixon and Ford, Earl Butz's "get big" sentiment versus author and farmer Wendell Berry's deeply-grounded, passionate plea for the small; or in U.S. Bureau of Reclamation Floyd Dominy's self-messianic justifications for his visions of western water development vs 60s era Sierra Club president David Brower's appeal to human insignificance in the vastness of geological time or while beholding the awesomeness of what he, following Muir, refers to as natural cathedrals.

Each of these cases features technocrats bent on their grandiose visions, whether a series of mega-dams across the entire Colorado River watershed, or maximizing agricultural productivity and profitability at the expense of small farmers and cultural continuity, or the application of scientific principles toward the maximally sustained yield of forests (or waters). And each case features a literary activist drawing directly from the poetry of the world as counter.

My penultimate case however is between the Craighead Brothers—John and Frank—and the Murie Brothers—Olaus and Adolph—over appropriate scientific practices in wildlands and the requisite management that I argue is already baked into these practices. Unlike the other cases, this deals specifically with management rather than development. The Craigheads pioneered modern conservation biology while working closely with the Department of Defense to develop new instruments applying Cold War enemy surveillance technology to wildlife, most notably Yellowstone's bears. The Muries, who followed in an older naturalist tradition founded upon so-called "shoe leather" study, objected to the Craigheads' quote "gadgetry" and to the increasing power of the quote "technologists".

They instead saw the importance of limited intervention in both scientific practice and management. Based on this case, I assess scientific practices in terms of the relationship between embodied engagement and visions of management.

I interpret each set of brothers as an exemplar of two archetypal approaches to knowing and acting towards the natural world: poetics and technics. I then trace these approaches back into lineages of thought and practice.

Poetics is a term I employ to capture not the art of creating poetry as it might often be understood, but a form of interactional attunement to the world, capable of restructuring language, thinking, and environmental management; a qualitative, nonformulaic assessment of what is true and what is right, which is fundamentally derived from embodied, sensuous experience of the world through a combination of practical everyday interaction, deliberate attentiveness, or rarer experiences in which our sense of self and world are challenged and, in some instances, shattered. It is related to knowing as being at home in something rather than propositional understanding.

Technics on the other hand is the apprehension and representation of the world by a "pure disincarnated rationality." Exemplified by modern science, this is a hard approach that attempts, with varying success perhaps in the face of immense complexity, to reduce nature to the calculable and controllable and act upon it in accordance with this vision. Technics entails processes of rationalization, decontextualization, simplification, and functional reductionism, is experimental rather than experiential, and most importantly, is mathematical in the sense characterized by philosopher Martin Heidegger as an a priori projection of certitude, wherein a predetermining projection is brought to bear on experience such that things themselves are "skipped over"—an a priori mathematical that blocks and challenges the world's revealing. The fullness, complexity, and qualitative richness of the elements of experience are hollowed out and made meaningless. This is thus a form of nihilism.

In formulating this dichotomy, I am working from Heidegger's contention that modern science—physics in particular—is the "basic form of technological thinking." Technology in this rendering is ultimately a form of thought that is merely expressed in material devices and environmental management. I thus focus my attention on assessing how we think, expressed in our interactions with nature: management and design. I have also taken up philosopher Albert Borgmann's focus on the modern standard of theoretical explanation, wherein "the laws of physics are the epitome of what we expect at the center of a theory." These insights allow me to draw parallels between epistemology and ethics, extending Heidegger's assessment in novel ways.

From this base, I present a series of critiques of modern normative ethical theory, which characterize it as either itself technological or insufficient to the task of accounting for technology—deficient in other words in form and scope. The deficiencies in scope—the oversights—of modern theoretical ethics include failing to take into account everyday material settings that enable or inhibit excellence and human flourishing; failing to substantively restrain disturbing technological developments such as autonomous and precision-guided weapons, the prospect of a creeping new eugenics founded in consumer preference rather than totalitarian utopian aspirations, and mass surveillance; failing in the face of the immense complexity and uncertainty of interconnected technological and ecological systems; failing to be useful in everyday decision making; and finally failing to be sufficiently empirical.

The form meanwhile of modern theoretical ethics is deficient insofar as it is overly procedural and methodological, insufficiently personal and transformative; is experimental insofar as it is focused on quandaries and overly constructed and abstruse thought experiments; and is algorithmic and calculative, seeking a device or formula for right action. Due to its form, I deem modern normative ethical theory to be itself technological. Due to both its form and oversights, I deem it to be implicated

in technocracy—the dominance of the technical over either democratic participation or the poetic or both.

Geoengineering, otherwise known as climate engineering, is a useful example. This is the deliberate manipulation of global climate through large-scale interventions, meant to compensate for the buildup of anthropogenic greenhouse gases and a so far insufficient global political response to curb said emissions. This could potentially be accomplished via carbon dioxide sequestration, solar radiation management (which is the continuous distribution of reflective aerosols into the upper atmosphere), the creation of algal blooms by dropping iron fillings into the ocean, or even the strategic distribution of silica throughout the Arctic to imitate the albedo effects of disappearing ice.

Climate engineering is usually critically assessed in one of a few ways:

1) Either, 1, by attending to its practical shortcomings: In the case of solar radiation management, relying on the artificial albedo effects of reflective particles, even as greenhouse gases continue to accrue, heightens the risk of sudden warming if this application falters, for these aerosols are short-lived, while carbon dioxide and certain other greenhouse gases are long-lived. Once begun, in other words, it may well perpetually lock us into this system. Meanwhile, the ocean would continue to acidify as it absorbs carbon dioxide, while other practical critiques might be prohibitive cost or unpredictable side effects.
2) Besides assessing its practical shortcomings, the second would be attending to its ethical shortcomings: Geoengineering could be considered unjust as it may have disproportionate regional impacts, particularly on vulnerable populations, or may be implemented without the input of underrepresented people. Or geoengineering might be assessed in terms of rights and duties: what obligations do we have as industrialized nations who have disproportionately contributed to climate change to mitigate it, and

might geoengineering satisfy these requirements? Or overall happiness: might geoengineering alleviate overall global suffering and thus justify its implementation? Or we may employ some other approach such as risk analysis, employing precautionary principles, etc.

Nearly all these approaches are in my rendering essentially technical—whether the calculations of risk analysis, cost, or utilitarian ethical calculus; or a deontological device grounded in the autonomous cartesian cogito. They have their place but are deficient in many of the ways I named above—in form and in scope.

To continue with the example of geoengineering, I offer a different approach—one grounded in embodied sensuality and attentiveness—a poetic inquiry that can raise more fundamental questions like: "what is the earth?", "what is the meaning of the earth?", "what is our relationship to it?", "how would geoengineering alter that relationship?", and "is engineering really the right way to even be conceiving of managing this planet?"

Is the earth a machine to live in—a procurer of rationally-delivered economically-efficient services that is best managed by the impoverished abstractions of mathematics? Or is it a bountiful, galloping, boisterous, flowing explosion of life—a wild earth? And not just ask the questions but deftly convey these meanings and relations, if imperfectly, giving a holistic sense of the world and our place in it upon which to judge the appropriateness of such interventions.

While geoengineering may seem logically intuitive from the perspective of a physicist or engineer, whose disciplines already conceive of the earth as essentially a mechanical system that can be known and altered from a mathematical foundation, and for whom geoengineering is a simple technological fix that can circumvent the complex social, political, and economic hurdles that have slowed the necessary global response to curtailing climate change; if implemented, it would be a drastic and inescapable expression of technological thinking, not simply in its strange side effects, including bleached white skies, but definitive of a new relationship with the earth as technological artifact—an

object of technical control and human intentionality guided by technics. Geoengineering is just an example.

The necessity of ecological and planetary design has in a sense been foisted upon humanity by pervasive and unintentional impacts on the biosphere and the requisite need to intelligently act. Design is an emerging political virtue that need be applied not only to the shared environment of our cities, but now to the atmosphere and biosphere. I trace this out this development in three stages of design that I apply both to wildlands management and climate change:

I call the first stage Natural Wild – This applies in the case of wildlands management to lands prior to designation or protected areas in which the three meanings of naturalness—lack of modern human impact, lack of intentional human control, or historical fidelity—are still unified; in the case of climate change, this refers to a global atmosphere essentially unhindered by anthropogenic greenhouse gas emissions.

The second stage is Unintentional Collective Degradation – This applies in the case of wildlands management to either widespread habitat loss or increasing mechanization (particularly road intrusion) leading to designation (a form of design itself), or extrinsic impacts, particularly localized effects of climate change, pervasive pollutants, and invasive species following designation, which ultimately causes the three meanings of naturalness to split; in the case of climate change, this refers primarily to rampant anthropogenic greenhouse gas emissions and deforestation.

The final stage is Deliberate Design – In the case of wildlands management, this is either management interventions, restoration, or ecological engineering, and hybrid approaches such as wild design; in the case of climate change, this refers to active restorative measures or geoengineering.

There is a crucial shift between the second and third stages (Unintentional Collective Degradation and Deliberate Design)—the imposition of human intentionality. Climate change is massively impactful, but unintentional. The effects of climate change within wilderness and other

wildlands are also massively impactful as is the varying suite of invasive species finding their way into these areas. It is however only when we begin to mitigate these impacts that our effects become intentional.

The increasing ubiquity of design is further evident when management actions and ecological interventions in wilderness are also understood as forms of design. Though there may always be some places that we intentionally choose to keep totally free from our intentions through a hands-off management approach that leaves room for nature's autonomy even as affected by pervasive human impacts, the trend is nevertheless towards intensifying ecological intervention.

There are standards of good design: one is democratic involvement, an uncontroversial premise; the other I argue is an expressly subservient relationship of technics to poetics where poetics grounds and directs technics. What I offer is a possibility for management, utilizing the vocabulary of design, that may thread the narrow gap between collective, unintentional degradation and technical control.

What is at issue here is the earth's wildness—not merely uncertainty or unpredictability, but a positive dimension of nature with its own emergent order—a meaningful expression of immanent bounteous will—purposeful movement towards the fulfilment of an insatiable internal drive—the ceaseless expansion of life—the cutting edge of existence.

I thus find some hope in navigating this new context of ubiquitous human influence and design in wildlands management—one of the only contexts in which wildness is explicitly, if indirectly, considered.

I give the example of the fledgling role of the Wilderness Character Narrative in U.S. wilderness management as a hopeful case, which expressly and practically grounds technics—in this case wilderness monitoring and management intervention—in the poetic—in this case a holistic narrative of place. I substantiate this emphasis on narrative, and poetics more generally, in a variety of other instances including architecture and medicine. Properly informed narrative is an instantiation of poetics.

The deft conveyance of meanings and relations to which I previously alluded may best be captured by narrative. I thus find in the Wilderness Character Narrative, and in other instances such as environmental design in architecture, an appropriate relationship between means and ends, the measurable and the unmeasurable; which, while retaining a substantive role for science and technology, creates an essential place for intuition and imagination, meaning and purpose, and what is referred to as "character"—an amalgamation of the biophysical; symbolic meanings of humility, restraint, and interdependence; and a felt sense of place based on direct experience.

I also apply some of these local insights at the immense scale of the earth's cryosphere—particularly its large bodies of ancient glacial ice—as a further case study and a representative of the relationship of humanity with nature writ large, a symbolic proxy for planetary environmental management. I scale up in other words from wildlands management to planetary design. I note how glaciers are often presented in science and in policy as watertowers or reservoirs—technological devices—and that the loss of glaciers and other large bodies of ice, including sea ice, ice sheets, and permafrost—as components of the cryosphere—are often similarly technically rendered and presented as, for instance, a loss of ecosystem services. Or surveilled and distilled into data. I maintain that disembodied technological surveillance and the interplanetary instrument of information it creates is a basis for technical control, whether ultimately attainable or not, and that these technical ways of speaking and thinking have ethical and practical implications: they "set things up" for technical management—a possibility expressed by, for instance, geoengineering.

These renderings contrast with the revelatory vision of John Muir—his self-proclaimed "glacial gospel"—or the social ontology of glaciers that "listen, pay attention, and respond to human behavior" held by the Tlingit and other indigenous peoples whose cultures have been deeply shaped by glaciers and ice.

What I intend with poetics is not just another form of analysis but rather to redefine the nature of ethics and decision making. I challenge the algorithmic and experimental approach of modern ethical thinking, which, like modern science, begins with the assured—as either a common measure of pleasure, or rationally deduced, universally applicable, self-imposed laws—appealing instead to a form of ethics that is a holistic sense of the ethical environment, based on a qualitative assessment of the world that is not reducible to any simplified ethical system or evaluated by any thought experiment that might be employed to assess rightness. It is rather an evolving component of culture that is responsive to the world's complexity—an experiential, non-technological ethic of humility and attentiveness—a wild ethic.

Following Heidegger, I draw parallels between knowing, acting upon wild nature via management and design, and ethics—each reflecting the modern propensity for technological thinking—with modern science, particularly physics, as the exemplary case. I thus offer a parallel palliative for all three: for knowing, I turn especially towards Goethe's experiential science and wilder counterparts found in Thoreau and scientist-explorer Alexander von Humboldt; in design, I seize upon wild design and practical poetics as I discussed previously in the context of foundational narratives; and in ethics I flesh out several characteristics of wild ethics as a poetical counterpart to technical ethics.

First, wild ethics operates quote "in the wild" as the phrase is often used by scientists and engineers, meaning beyond the laboratory in real, everyday, uncontrolled, messy, vast interconnected networks—the realm where theories and plans inevitably fall short and break down—where unbridled complexity reigns.

Second, wild ethics is forged in, and is necessarily a product of, prolonged contact with wild nature. Engagement and setting matters. This is no armchair philosophy and demands embodied, sensuous immersion in wild places.

Third, wild ethics is not simply and narrowly determinate as theory. It hearkens back instead to the etymological roots of "theory" in theoria, which was in Ancient Greece a cultural practice of taking "a journey abroad for the sake of witnessing an event or spectacle." Theoria is part of a way of life that lingers with things; while beholding—as opposed to modern theorizing—necessarily places oneself into context, into "an intimate immersion in the world." Wild ethics moves beyond theory into practices—both scientific and everyday, is responsive to immediate solicitations, and seeks to regain the moral implications of nature as a normative principle.

Fourth, wild ethics takes on an alternate form. It is the poetical counterpart to dry, impersonal, technical ethics. Things, places, and situations are themselves conjured through evocative language—the products of embodied experience. This can occur through narrative, which conveys singularity, contingency, relations of care, and the fullness of experience and may best be exemplified in the writings of Thoreau or in many of the world's oral traditions.

Finally, wild ethics is open to multiple streams of ethical traditions. Modernity has to its credit released us from blind adherence to tradition and dogma, but it has gone too far in overlooking the ongoing importance of tradition. In privileging engagement in a way that analytic approaches do not, and by taking seriously empirical considerations of ethics—through for instance the anthropology of ethics or studies of traditional ecological knowledge—wild ethics offers a renewed consideration of tradition. In distinction to the formal ethics of professional philosophy—modern theoretical ethics particularly—traditional conservation ethics—the adaptive set of values and practical rules of thumb for acting in the world often held by indigenous peoples—is informal and lived. It is nested in complexity and emerges from practical interactions with the world within a living community. Empirical inquiry reveals that conservation ethics evolves in the context of particular places and situations—it is the product of "long-term incremental learning of individuals from lived experience."

This openness to multiple streams of ethical traditions opens the possibility of finding points of commonality and departure through comparative cultural analysis. I utilize this to begin to build bridges and offer useful comparisons between wilderness ethics and traditional conservation ethics. I posit that what both wilderness conservation ethics and traditional conservation ethics in its myriad forms share is that they both emerged from the land rather than the classroom. Each are in this sense wild ethics.

Wild ethics is not virtue ethics, but it does share some of its emphasis on self-cultivation and its distrust of Enlightenment ethics. Humility and attentiveness are however two virtues that best exemplify wild ethics: a basic sense of uncertainty and unknowing in the face of radical complexity, and a concentrated perception and deliberate beholding of the world's grandeur—both large and small.

With wild ethics, I have sought a path beyond both the distancing dryness of calculation and analysis, and the numbness of a perpetually disassembling critical stance—both of which leave the world emptied out, creating a void easily filled by the technological.

I argue that just as with science and design, poetics—in this case, the concrete and experiential rendered in prose, offering testimonial to the particularities at stake as well as an overall sense of orientation and significance—should guide and direct technics within environmental ethics lest it remain impotent in the face of technology. By so integrating poetics into ethics and design, I offer a hopeful path through the paradox of ubiquitous design insofar as it would seem to preclude the possibility of wild nature in any meaningful sense. There is a deliberatelessness in poetics—a way in which the world—the quote "voice" of wild nature—can insert itself into design by seizing the embodied imagination of the designer.

The ethical approach I offer is forged in experience and drips with the wild presence of things. It is concrete, personal, evocative, and sits at the limits of theory as it is usually understood. Wild ethics is poetic in the sense that I have defined—in short this means that it operates contrary to the dictates of

technology and as such fundamentally challenges technocratic management and design of earth systems both large and small. Wild ethics is however still struggling to be born.

Heidegger calls poetry “a measure for all measuring.” I have carried this insight into the broader context of poetics as a measure for design, a measure for knowing, and a measure for ethics—grounding and directing each of these, at times through narrative. This sentiment is nicely articulated by architect Louis Kahn who writes, “I only wish that the first really worthwhile discovery of science would be that it recognized that the unmeasurable is what they’re really fighting to understand, and that the measurable is only the servant of the unmeasurable; that everything that man makes must be fundamentally unmeasurable.”

Thank you